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CHEMICAL SOCIETIES
OF THE
NINETEENTH CENTURY.

BY

HENRY CARRINGTON BOLTON.

CITY OF WASHINGTON:
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CHEMICAL SOCIETIES OF THE XIX CENTURY.*

By Henry Carrington Bolton, Ph.D.

The beginning of a new century affords an opportune period for chronicling the progress of chemistry as shown by the organizations formed to foster its study and to stimulate its adherents. In the following pages an attempt has been made to place on record the statistics of the Chemical Societies of the World for the year 1900, and to indicate those that ended their careers within the nineteenth century. The data have been obtained chiefly by correspondence, and thanks are due to the officers of societies who have responded to inquiries. I am also under special obligations to Dr. Paul Dorveaux, Librarian of the École Supérieure de Pharmacie, Paris; to Professor Bohuslav Brauner, of the Bohemian University, Prague; to Professor George W. A. Kahlbaum, of the University of Basel; and particularly to the Smithsonian Institution, for aid in securing the information sought.

The fact that chemical societies were organized and in operation in the United States of America long before they existed in Europe has been shown in my paper, "Early American Chemical Societies," read to the Chemical Society of Washington, April 8, 1897. The two pioneers in this field were the "Chemical Society of Philadelphia," founded in 1792, and the "Columbian Chemical Society of Philadelphia," founded in 1811. Of these some particulars will be found in their proper order.

In the following list the societies are placed in chronological order under each country, and the countries are arranged alphabetically. Of each society the following data are given so far as attainable:

Seat, and date of founding,
Name of President, and membership in 1900,†
Serial publications,‡
Remarks.

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* Read at the 25th Anniversary of the American Chemical Society held in New York City, April 12–13, 1901.

† No deductions have been made for duplication.

‡ For full details consult: A Select Bibliography of Chemistry, by Henry Carrington Bolton, Washington, 1893–1899. 3 vols. 8vo.

The results of this census are given in the following Table:

CHEMICAL SOCIETIES OF THE WORLD.

MEMBERSHIP IN 1900.

Country.	*No. of Societies.*	*No. of Members.*
Austria	7	3,072
Belgium	3	740
France	10	4,065
Germany	10	7,559
Great Britain	9	7,550
Italy	5	479
Japan	2	1,012
Russia	1	327
South Africa	1	(?)
Switzerland	2	94
United States America	5	2,379
Victoria	1	100
TOTALS	56	27,377

March, 1901.
WASHINGTON, D. C.

AUSTRIA.

Centralverein für Rübenzucker Industrie in der oesterreichisch-ungarischen Monarchie.

Founded in 1854 at Vienna. In 1900: President, August Freiherr von Stummer; members, 213; associates, 49.

Publications: Organ des Vereins für R.–I., 1863–1874; Organ des Centralvereins für R.–I., 1875–1887; Oesterreichisch-ungarische Zeitschrift für Zucker-Industrie und Landwirthschaft, 1888–1900. (Beilagen): Der Marktbericht, 1874–1885; Wochenschrift des Centralvereins für Rübenzucker in der oesterreichisch-ungarischen Monarchie, 1886–1900.

Note.—The Society maintains a Chemical Experiment Station under the direction of F. Stohmer.

Verein zur Hebung der Zuckerfabrikation im Königreich Böhmen. [Also with a Bohemian name.]

Founded in 1868 at Prag under the presidency of Ferdinand Urbánek; the languages used were Bohemian and German. It was disbanded in 1874.

Publication: Zeitschrift für Zucker-Industrie. Organ des Vereins. Prag. 3 vols., 1872–74.

Note.—This journal is not to be confounded with: Zeitschrift für Zucker-Industrie in Böhmen, established at Prag in 1877 and current.

Chemicka Společnost: Spolek Českých chemiků. [Chemical Society: Union of Bohemian Chemists.]

Founded in 1872 at Prag. In 1900: President, K. Preis; honorary members, 11; active members, 318; correspondents, 77.

Publications: Zprávy spolku českých chemiků. 2 vols., 1872–76. (Reports.) Listy Chemické, 1877–1900. (Letters.)

Note.—The Society has also published a Chemická Knihovna (Chemical Library) in 8 vols.

Zemsky spolek pro průmysl cukrovarnický v Čechách; Verein der Zuckerindustrie im Königreich Böhmen.

Founded in 1876 at Prag. In 1900: President, Gustav Hodek; members, 325.

Publications: Zeitschrift für Zucker-Industrie in Böhmen, 1877–1900. (Beilage): Prager Zuckermarkt, 1881–1900.

OESTERREICHISCHE GESELLSCHAFT ZUR FÖRDERUNG DER CHEMISCHEN INDUSTRIE.

Founded in 1878 at Prag. In 1900: President, Georg Zetter; honorary members, 3; members, 196.

Publications: Bericht der oesterreichischen Gesellschaft zur Förderung der chemischen Industrie, 1879–98. Since 1899 the organ of the Society is: Oesterreichische Chemiker-Zeitung.

SPOLEČNOST PRO PRŮMYSL CHEMICKÝ. [Society of Chemical Industry.]

Founded in 1892 at Prag. In 1900: President, J. B. Lambl; honorary members, 20; active members, 440; correspondents, 54; founders, 57.

Publications: The organ of the Society since 1892 is: Časopis pro průmysl chemický, of Prag, which had been established in 1891. The Society has also published three volumes of a technological library: Knihovna technologicko chemická.

WIENER VEREIN ZUR FÖRDERUNG DES PHYSIKALISCHEN UND CHEMISCHEN UNTERRICHTS.

Founded in 1895 at Vienna. In 1900: President, Victor von Lang; members, 317.

Publication: Vierteljahrsberichte der Wiener Verein zur Förderung des physikalischen und chemischen Unterrichts, 1895–1900.

VEREIN OESTERREICHISCHER CHEMIKER IN WIEN.

Founded in 1897 at Vienna. In 1900: President, J. Klaudy; members, 878; founders, 14.

Publication: Oesterreichische Chemiker Zeitung, 1898–1900.

BELGIUM.

ASSOCIATION BELGE DES CHIMISTES.,

Founded August 4, 1887, at Brussels. In 1900: President, L. L. de Koninck; honorary members, 4; active members, 482; associates, 21; correspondents, 8.

Publication: Bulletin de l'Association Belge des Chimistes, 1887–1900.

NOTE.—The Association has 8 sections, viz: Liége, Louvain, Gembloux, Charleroi, Mons, Gans, Antwerp, Brussels.

SOCIÉTÉ TECHNIQUE ET CHIMIQUE DE SUCRERIE DE BELGIQUE.

Founded February 26, 1896, at Brussels. In 1900: President, Eugène Meeus; members, 173; patron, 1.

> *Publications:* La sucrerie Belge, which was established August 31, 1872, has been the organ of the Society since its foundation. The Society has also published several pamphlets on technical topics.

NOTE.—The formation of Sections was under discussion in 1900.

SYNDICAT DES CHIMISTES PUBLICS DE BELGIQUE.

Founded in 1897 at Brussels. In 1900: President, François Sachs; members, 51.

> *Publication:* Bulletin du Syndicat des chimistes publics de Belgique, 1897–1900.

NOTE.—The Society has in preparation: Recueil générale des méthodes d'analyse usitée dans les laboratoires publics.

SOCIÉTÉ GÉNÉRALE DES FABRICANTS DE SUCRE DE BELGIQUE is not a chemical society; its organ is: La sucrerie Belge, 1872–1900.

FRANCE.

SOCIÉTÉ INDUSTRIELLE DE MULHOUSE.

Founded in December, 1825, at Mulhouse (first meeting, May 11, 1826). In 1900: President, Auguste Dollfus; honorary members, 9; resident members, 190; non-resident members, 378; correspondents, 54.

> *Publication:* Bulletin de la Société industrielle de Mulhausen (*sic*), 1827–1900.

NOTE.—This is not purely a chemical society, but it has a Committee on chemistry, and its Bulletin contains many papers on applied chemistry.

SOCIÉTÉ CHIMIQUE DE PARIS.

Founded June 4, 1857, at Paris. In 1900: President, Edouard Grimaux; members, 365; patrons, 121; life members, 91; corresponding members, 449.

> *Publications:* (*a*) Bulletin des séances de la Société chimique de Paris, 1858–62; (*b*) Répertoire de chimie pure et appliquée, 1858–63; (*c*) Bulletin de la Société chimique de Paris, 1864–1900; (*d*) Conférences et Leçons, 5 vols.

ASSOCIATION DES ÉLÈVES DE M. FREMY.

Founded in 1878 at Paris. In 1900: President, Louis Barthélemy; members, 200.

Publication: Bulletin trimestriel de l'Association des élèves de M. Fremy, 1878–1900.

NOTE.—A social organization which, however, publishes the work of its members.

ASSOCIATION DES CHIMISTES DE SUCRERIE ET DE DISTILLERIE DE FRANCE ET DES COLONIES.

Founded in 1883 at Paris. In 1900: President, M. Durin; honorary members, 3; resident members, 160; non-resident members, 710; corresponding members, 395.

Publication: Bulletin de l'Association des chimistes de sucrerie et de distillerie de France et des Colonies, 1883–1900.

ASSOCIATION AMICALE DES ANCIENS ÉLÈVES DE L'ÉCOLE DE PHYSIQUE ET DE CHIMIE INDUSTRIELLE DE LA VILLE DE PARIS.

Founded in 1885 at Paris. In 1900: President, Octave Boudouard; honorary members, 41; members, 300.

Publication: Bulletin mensuel de l'Association amicale des anciens élèves de l'École de physique et de chimie industrielle de la ville de Paris, 1885–1900. Annuaire [etc.], 1885–1900.

ASSOCIATION AMICALE DES ANCIENS ÉLÈVES DE L'ÉCOLE DE CHIMIE INDUSTRIELLE DE L'LYON.

Founded in 1886 at the Institut chimique de Lyon. In 1900: President, Alphonse Seyewitz; honorary members, 6; members, 104.

Publication: Bulletin des séances de l'Association amicale des anciens élèves de l'École de chimie industrielle de Lyon.

SYNDICAT CENTRAL DES CHIMISTES ET ESSAYEURS DE FRANCE.

Founded in 1890 at Paris. In 1900: President, Ferdinand Jean; members, 125.

Publications: Revue de chimie analytique appliquée à l'industrie, 1893–98. Annales de chimie analytique appliquée à l'industrie became the organ of the Society in 1899; the Annales had been established in 1896, and was united with the Revue (above named) in 1899.

SOCIÉTÉ CHIMIQUE DU NORD DE LA FRANCE.

Founded at Lille in 1891. In 1900: President, A. Pouriez; members, 100.

Publication: Bulletin mensuel de la Société chimique du Nord de la France, 1891–1900

ASSOCIATION AMICALE DES ANCIENS ÉLÈVES DE L'INSTITUT CHIMIQUE DE NANCY.

Founded November 9, 1892, at Nancy. In 1900: President, M. Noel; honorary members, 8; patrons, 7; members, 52; associates, 75.

Publication: Bulletin (annuel) de l'Association.

ASSOCIATION AMICALE DES ÉLÈVES ET ANCIENS ÉLÈVES DU LABORATOIRE D'ENSEIGNMENT PRATIQUE APPLIQUÉE DE L'UNIVERSITÉ DE PARIS.

Founded in 1897 at Paris. In 1900: President, M. Loyer; honorary members, 12; members, 110.

Publication: Gazette de chimie, Paris, 1900.

GERMANY.

VEREIN FÜR DIE RÜBENZUCKER INDUSTRIE IM ZOLLVEREIN [later, DES DEUTSCHEN REICHS; later, VEREIN DER DEUTSCHEN ZUCKERINDUSTRIE].

Founded in 1850 at Berlin. In 1900: President, De Coste; members, 447.

Publication: Zeitschrift des Vereins [etc.], 1850–1900.

DEUTSCHE CHEMISCHE GESELLSCHAFT ZU BERLIN.

Founded in 1867 at Berlin. In 1900: President, G. Volhard; honorary members, 15; life members, 92; members, 2637; associates, 372.

Publication: Berichte der deutschen chemischen Gesellschaft zu Berlin, 1868–1900. Since 1897 also: Chemisches Centralblatt (established in 1830).

VEREIN ANALYTISCHER CHEMIKER.

Founded in 1878 at Magdeburg, and merged in 1887 with the Deutsche Gesellschaft für angewandte Chemie. *See* Verein deutscher Chemiker.

Publication: Correspondenzblatt des Vereines analytischer Chemiker, 1878–80.

Freie Vereinigung bayerischer Vertreter der angewandten Chemie.

Founded in May, 1883, at Munich. In 1900: President, Albert Hilger; honorary members, 2; members, 124; correspondents, 69.

Publications: Bericht über die 1 [– 18] Versammlung der freien Vereinigung bayerischer Vertreter der angewandten Chemie, 1883–1900. Also reports in: Forschungsberichte über Lebensmittel und ihre Beziehung zur Hygiene, 1894–97: and in: Zeitschrift für Untersuchung der Nahrungs- und Genuss-Mittel, 1898–1900.

Verein deutscher Berufs-Chemiker.

Founded in 1887 at Dresden.

Publication: The "Chemiker und Droguist" (Dresden, 1885) had in 1887 the sub-title: Correspondenzblatt des Vereines deutscher Berufs Chemiker. This title was dropped in 1888.

Deutsche Gesellschaft für angewandte Chemie.

Founded November, 1887, at Berlin, absorbing the Verein analytischer Chemiker. In 1896 the Society became: Verein deutscher Chemiker, *q. v.*

Publication: Zeitschrift für angewandte Chemie, 1888–1900. This was begun as: Zeitschrift für die chemische Industrie in 1887.

Vereinigung öffentlicher analytischer Chemiker Sachsens.

Founded in 1890 at Plauen in Vogtland. In 1900: President, Arthur Forster; members, about 25.

Publication: Zeitschrift für öffentliche Chemie, 1897–1900. Also: Bericht über die Hamptversammlung des Vereines öffentlicher analytischer Chemiker Sachsens.

Verein akademisch-gebildete [later, deutscher] Zuckertechniker.

Founded in 1891 at Berlin. In 1900: President, H. Claassen; honorary members, 1; members, 406; correspondents, 3.

Publication: Zeitschrift des Vereins akademisch-gebildete Zuckertechniker, 1891–92.

Note.—The organ of publication changed several times.

Verband des Laboratoriums-Vorstände von deutschen Hochschulen.

Founded in 1898 [?].

ZWEIGVEREIN DER ZUCKERTECHNIKER FÜR DAS AUSLAND.

Founded at Berlin. In 1901: President, C. Huck.

DEUTSCHE ELEKTROCHEMISCHE GESELLSCHAFT.

Founded in October, 1894, at Berlin. In 1900: President, J. H. van't Hoff; members, about 700.

Publication: Bericht der deutschen elektrochemischen Gesellschaft. 1894–1900.

VEREIN DEUTSCHER CHEMIKER.

Founded in 1896 at Berlin, as successor to Gesellschaft für angewandte Chemie (1887). Its seat is the residence of the President for a given year. In 1900: President, H. Caro; honorary members, 4; members, 2271. Embraced in 1900 the following sections (Bezirk-Vereine): Aachen, Belgien, Berlin, Frankfurt, Hamburg, Hannover, Mittel-Franken, Mittel- und Niederschlesien, Oberrhein, Oberschlesien, Pommern, Rheinland, Rheinland-Westphalen, Saar, Sachsen-Anhalt, Sachsen-Thüringen, Württemberg.

Publication: Zeitschrift für angewandte Chemie, 1887–1900. *Cf.* Deutsche Gesellschaft für angewandte Chemie.

VERBAND SELBSTÄNDIGER ÖFFENTLICHER CHEMIKER DEUTSCHLANDS.

Founded May 30, 1896, at Nürnberg. In 1900: President, Robert Kayser; members, 161; associates, 102.

Publication: Zeitschrift für öffentliche Chemie (established in 1895), 1897–1900. Also Vol. I. as Vol. III., 1897, of Centralblatt für Nahrungs- und Genussmittel Chemie, sowie Hygiene.

GREAT BRITAIN.

SOCIETY FOR PHILOSOPHICAL EXPERIMENTS.

Founded in 1794 at London.

Publication: Minutes of the Society for Philosophical Experiments, 1794.

NOTE.—A German translation of the *Minutes* was edited by Alex. Nic. Scherer and published at Halle in 1803.

CHEMICAL SECTION OF THE BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

Founded in 1831. This is, however, a corporate part of the British Association, and the papers read to the Section are published in the annual Reports of the British Association, 1831–1900. In 1900: President, W. H. Perkin, jun.; number of members not given.

Chemical Society of London.

Founded in 1841 at London. In 1900: President, T. E. Thorpe; honorary and foreign members, 33; members, 2300.

Publications: Memoirs and Proceedings of the Chemical Society of London (1841–48); Quarterly Journal, 1849–62; Journal of the Chemical Society, 1863–1900.

Society of Public Analysts.

Founded in 1874 at London. In 1900: President, Walter W. Fisher; honorary members, 9; members, 260.

Publication: Proceedings of the Society of Public Analysts, 1876; The Analyst, 1877–1900.

Institute of Chemistry of Great Britain and Ireland.

Founded October, 1877, in London; incorporated, 1885. In 1900: President, John Miller Thomson; members, fellows, and associates, 1008 (resident members, 904); students, 118. Total, 1126.

Publications: Proceedings, half yearly, 1878–1900; Register, yearly, 1878–1900; Regulations, yearly, 1878–1900.

Society of Chemical Industry.

Founded in 1881 at London. In 1900: President, Charles F. Chandler; honorary member, 1 (John Glover); members, 3459.

Publication: Journal of the Society of Chemical Industry, 1882–1900.

Note.—The Society has eight sections: London, Liverpool, Manchester, Newcastle, New York, Nottingham, Scotland, and Yorkshire.

Society of Dyers and Colourists.

Founded in 1884 at Bradford. In 1900: President, H. Grandage; honorary members, 3; members, 553.

Publication: Journal of the Society of Dyers and Colourists, 1884–1900.

Alembic Club.

Founded in 1889 at Edinburgh. This is a private club of only six members and has no president; the Secretary is Leonard Dobbin.

Publishes no journal, but has issued 15 Reprints of Chemical Monographs, etc., 1893–1900, and other works.

INTERNATIONAL ASSOCIATION OF LEATHER-TRADES CHEMISTS.

Founded September, 1897, at London. In 1900: President H. R. Proctor; number of members, ——.

Publication: Report of the Proceedings of the Conference of Leather-Trades Chemists, 1897.

ITALY.

ASSOCIAZIONE CHIMICO-FARMACEUTICA FIORENTINA.

Founded in 1877 at Florence. In 1900: honorary members, 20; resident members, 100.

Publication: L'Orosi, Bollettino di chimica, farmacia e scienze affini. Firenze, 1878–1900.

SOCIETÀ CHIMICA DI MILANO.

Founded in February, 1895, at Milan. In 1900: President, Angelo Menozzi; resident members, 152; correspondents, 133.

Publication: Annuario della Società chimica di Milano, 1896–1900.

ASSOCIAZIONE CHIMICO-INDUSTRIALE DI TORINO.

Founded June 25, 1899, at Turin. In 1900: President, Vittorio Sclopis; honorary members, 4; resident members, 103; correspondents, 87.

Publication: La Chimica industriale, 1899–1900.

SOCIETÀ ITALIANA DEI CHIMICI ANALISTI.

Founded in 1893 at Pavia.

Publication: Atti ufficiale delle Società italiana dei chimici analisti, 1893. This forms a pamphlet of 18 pp. only, and is perhaps a mere prospectus, as the Society ceased to exist before 1900.

JAPAN.

CHEMICAL SOCIETY OF TOKYO.

Founded April, 1878, at Tokyo. In 1900: President, Naokichi Matsui; number of members, 156; associates, 197.

Publication: Tokyo Kagakkai Kaishi. 1880–1900.

SOCIETY OF CHEMICAL INDUSTRY OF JAPAN.

Founded February, 1898, at Tokyo. In 1900: President, Takeaki Enomoto; honorary members, 7; members, 223; associates, 429.

Publication: Kōgyō Kagaku Zasshi, 1898–1900.

RUSSIA.

RUSSKAGO KHIMICHESKAGO OBSHTCHESTVA [Russian Chemical Society].

Founded October 26, 1868. The Chairman of the first meeting was D. Mendeléeff. In 1900: President, F. F. Petrushevsky; members, 327.

Publications: Zhurnal Russkago Khimicheskago Obshtchestva. St. Petersburg, 1869–72, 4 vols.

Continued as:

Zhurnal Russkago Khimicheskago Obshtchestva i Fisicheskago Obshtchestva, 1873–78. 6 vols.

Continued as:

Zhurnal Russkago Fisiko-Khimicheskago Obshtchestva, 1879–1900.

SOUTH AFRICA.

CHEMICAL AND METALLURGICAL SOCIETY OF SOUTH AFRICA.

Founded May, 1894, at Johannesburg.

Publication: Proceedings of the Chemical and Metallurgical Society of South Africa, 1894–1897.

SWITZERLAND.

SOCIÉTÉ CHIMIQUE DE GENÈVE.

Founded February 10, 1878, at Geneva. In 1900: President, F. Kehrmann.

Publication: The Minutes of the monthly meetings are published in: Archives des sciences physiques et naturelles de Genève. and in the Chemiker Zeitung.

VEREIN SCHWEIZERISCHER ANALYTISCHER CHEMIKER.

Founded March 12, 1887, at Zürich. In 1900: President, A. Bertschinger; number of members, 94.

Publication: The organ of the Society is Schweizerische Wochenschrift für Chemie und Pharmacie, which was established under the title, Schweizerische Zeitschrift für Pharmacie, 1856–62.

UNITED STATES OF AMERICA.

CHEMICAL SOCIETY OF PHILADELPHIA.

Founded in 1792 at Philadelphia, under the presidency of James Woodhouse. Number of members unknown. The Society was in existence for more than ten years.

Publication: Memoir on the Supply and Application of the Blowpipe [etc.] by Robert Hare, 1802.

COLUMBIAN CHEMICAL SOCIETY OF PHILADELPHIA.

Founded August, 1811, at Philadelphia, under the presidency of James Cutbush. Honorary members, 69; junior members, 13.

Publication: Memoirs of the Columbian Chemical Society of Philadelphia. Vol. I., 1813.

CHEMICAL SECTION OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

A migratory organization, founded in 1875 as a Sub-Section; it became Section C of the A. A. A. S. in 1882 at the second meeting in Montreal. In 1900: Chairman of the Section, Jas. Lewis Howe; members, 89; fellows, 181.

Publications: The Proceedings of the A. A. A. S. has a division containing papers read before the Section of Chemistry.

AMERICAN CHEMICAL SOCIETY.

Founded April 20, 1876, in New York City. In 1900: President, William McMurtrie; honorary members, 10; members, 1546; associates, 123.

Publications: Proceedings of the American Chemical Society, 1877–78; Journal of the American Chemical Society, 1879–1900.

Note.—In 1900 the Society had 12 sections: Rhode Island, Cincinnati, New York, Washington, Lehigh Valley, Chicago, Nebraska, North Carolina, Columbus, North Eastern, Philadelphia, and Michigan.

ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.

Founded September 8, 1884, at Philadelphia. In 1900: President, B. W. Kilgore; members, 350.

Publications: Methods of Analyses, 1884–88; Proceedings, 1889–1900.

NOTE.—Conventions of the Official Agricultural Chemists had been held prior to 1884; in 1880 at Washington and Boston; in 1881 at Cincinnati; and in May, 1884, at Atlanta.

Chemical Society of Washington.

Founded at Washington in 1884. In 1893 became the Washington Section of the American Chemical Society, retaining also its name as above. In 1900: President, H. Carrington Bolton; members, 114.

Publication: Bulletin of the Chemical Society of Washington, 1884–92.

New England Association of Chemistry Teachers.

Founded February 19, 1898. Meetings are held in New England. In 1900: President, Rufus P. Williams; honorary members, 8; active members, 50; associates, 22.

Publications: Circulars of Information and Reports, 1898–1900. Also Registers.

VICTORIA.

Society of Chemical Industry of Victoria.

Founded in 1900 under the Presidency of Orme Masson; membership, about 100.

ADDENDUM.

Société d'Arcueil.

Founded in 1807 at Arcueil. Dissolved in 1822. Members (at any one time), 12.

Publication: Mémoires de physique et de chimie. Paris, 3 vols., 8vo. 1807–17.

Note.—This private organization was founded by C. L. Berthollet; the meetings were held at his country house in Arcueil, near Paris. The membership included: La Place, C. L. Berthollet and his son A. B. Berthollet, Biot, Gay Lussac, Humboldt, Thénard, Decandolle, Collet-Descotils, Berard, Chaptal, Dulong, Poisson, Malus.

The foregoing list does not include Academies of science nor Associations of general science (with a few exceptions); it does not embrace societies having for their object industries involving chemical processes in part, excepting the refining of sugar; nor does it include the numerous societies of brewers and of beer-making, among which may be named the following:

Brau-Industrie Verein im Königreich Böhmen, founded at Prague in 1874, and publishing the Böhmische Bierbrauer.

Deutsche Brauerbund, founded at Nürnberg in 1861, and publishing the Allgemeine Hopfen-Zeitung.

Württembergische Brauerbund, founded at Waldsee in 1872, and publishing the Schwäbische Bierbrauer.

Badische Brauerbund, founded at Nürnberg in 1876, and publishing the Hopfenlaube.

Deutsche Braumeister Verein, founded at Berlin, 1887, and publishing the Deutsche Brau-Industrie.

Association générale des brasseurs Belges, founded at Brussels in 1874, and publishing Revue des Bieres.

County Brewers' Society, England, publishing since 1871 the Brewers' Guardian.

SMITHSONIAN MISCELLANEOUS COLLECTIONS

PART OF VOLUME XLVI

INDEX TO THE LITERATURE

OF

GALLIUM

1874-1903

PREPARED BY

PHILIP E. BROWNING, PH. D.

(No. 1543)

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
1904

WASHINGTON, D. C.
PRESS OF JUDD & DETWEILER
1904

LETTER OF TRANSMITTAL.

Washington and Lee University,
Department of Chemistry,
Lexington, Va., *October 18, 1904.*

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the following:

Index to the Literature of Gallium, 1875–1903;

Index to the Literature of Germanium, 1886–1903;

both prepared by Philip E. Browning, Ph. D., of the Kent Chemical Laboratory of Yale University.

James Lewis Howe,
Chairman.

Mr. S. P. Langley,
Secretary of the Smithsonian Institution.

This publication forms one of the following series:

Index to the Literature of Uranium, 1785–1885, by Henry Carrington Bolton, 1885.
Index to the Literature of Columbium, 1801–1887, by Frank W. Traphagen, 1888.
Index to the Literature of the Spectroscope, by Alfred Tuckerman, 1888, 1902.
Index to the Literature of Thermodynamics, by Alfred Tuckerman, 1890.
A Bibliography of the Chemical Influence of Light, by Alfred Tuckerman, 1891.
A Bibliography of Aceto-Acetic Ester, by Paul H. Seymour, 1894.
Index to the Literature of Didymium, 1842–1893, by A. C. Langmuir, 1895.
Indexes to the Literature of Cerium and Lanthanum, by W. H. Magee, 1895.
A Bibliography of the Metals of the Platinum Group, by Jas. Lewis Howe, 1897.
Review and Bibliography of the Metallic Carbides, by J. A. Mathews, 1898.
Index to the Literature of Thallium, 1861–1897, by Miss Martha Doan, 1898.
Index to the Literature of Zirconium, by A. C. Langmuir and Charles Baskerville, 1899.
A Bibliography of the Analytical Chemistry of Manganese, 1785–1900, by Henry P. Talbot and John W. Brown, 1902.
Index to the Literature of Thorium, 1817–1902, by Cavalier H. Joüet, 1903.

INDEX TO THE LITERATURE OF GALLIUM.

(1875-1903.)

PREPARED BY PHILIP E. BROWNING.

1875: (1). Lecoq de Boisbaudran. (Discovery.)

Compt. rend., lxxxi, 493; Ber. viii, 1355, 1680; Ztschr. Anal. Chem., xvi, 239; Bull. Soc. Chim. (Paris), n. f., xxiv, 370; Amer. J. Sci., (3), xi, 320; Jsb. (1875), 205; Pogg. Ann., clviii, 494; Chem. News, xxxii, 159, 294; Amer. Chemist, vi, 146; Pharm. J. Trans., (3), vi, 282; N. Arch. Ph. Nat. liv., 283; Ann. Chim. Phys., (5), x, 100; J. Chem. Soc. (Lond.), xxx, 190; Chem. Centrbl. (1875), 658; Ding. Pol. J., ccxviii, 376; Tidsskrift, (1), xiv, 349; Gazz. Chim. Ital., viii, 24; Phil. Mag., l, 414; Monit. Scientif. (1876), 88; Berg. u. Hüttenmännische Ztg. (1876), 198, 207, 237; Arch. der Pharm., v, 352; Deutsche Industriezeit (1875), 731.

1875: (2). Hugo. (Objection to name.)

Compt. rend., lxxxi, 530.

1875: (3). Mendeleeff. (Prediction previous to discovery.)

Compt. rend., lxxxi, 969; J. Chem. Soc. (Lond.), xxx, 530; Chem. News, xxxii, 293; Jsb. (1875), 207; Bull. Soc. Chim., n. f., xxv, 295; Chem. Centrbl. (1875), 817; Phil. Mag., (5), i, 542.

1876: (1). Lecoq de Boisbaudran. (Spectrum.)

Compt. Rend., lxxxii, 168; Chem. News, xxxiii, 35; Phil. Mag., (5), i, 176; Amer. Chemist, vi, 299; Chem. Centrbl. (1876), 194.

1876: (2). Lecoq de Boisbaudran. (Physical and chemical properties of the metal.)

Compt. rend., lxxxii, 1036, 1037; Bull. Soc. Chim. (Paris), (2), xxv, 400, 521; xxvi, 158, 433; Arch. Ph. Nat., lvi, 45; Chem. News, xxxiv, 150, 183; Phil. Mag., (5), ii, 398, 479; Pogg. Ann., clviii, 494; Chem. Centrbl. (1876), 451, (1877), 19; Gazz. Chim. Ital., vii, 32; Ber., ix, 64, 1608, 1807.

1876: (3). Lecoq de Boisbaudran. (Extraction.)

Compt. rend., lxxxii, 1098; lxxxiii, 636; Bull. Soc. Chim. (Paris), (2), xxvii, 49, 144; J. Chem. Soc. (Lond.), xxx, 275; xxxi, 48, 521; Chem. Centrbl. (1876), 452, 705; Gazz. Chim. Ital., vii, 34; Chem. News, xxxiii, 230; xxxiv, 173; Ber., ix, 726, 731; Phil. Mag., (5), ii, 480.

1876: (4). Lecoq de Boisbaudran. (Physical properties.)

Compt. rend., lxxxiii, 611, 1100; Phil. Mag., (5), i, 175; ii, 398; Wag. Jsb., xxiii, 7; Chem. News, xxxiii, 193; Bull. Soc. Chim. (Paris), xxvi, 458; Arch. d. Pharm., vii, 453.

1876: (5). Delachanal and Mermet. (Presence in zinc.)

Bull. Soc. Chim. (Paris), n. f., xxv, 197; xxvii, 49; Chem. Centrbl. (1876), 339; Ber., x, 91; Wag. Jsb., xxii, 1; xxiii, 9.

1876: (6). Lecoq de Boisbaudran. (Reactions, behavior toward reagents.)

Compt. rend., lxxxiii, 663, 824; Chem. Centrbl. (1876), 721; (1877), 51; Chem. News, xxxiv, 217.

1876: (7). Lecoq de Boisbaudran. (Gallium crystals.)

Compt. rend., lxxxiii, 1044; J. Chem. Soc. (Lond.), xxxi, 440; Chem. News, xxxv, 11; Chem. Centrbl. (1877), 65.

1877: (1). Muir. (Comparison with Ekaaluminum.)

Phil. Mag., (5), iii, 281; Chem. Centrbl. (1877), 434; Wag. Jsb., xxiii, 8.

1877: (2). Lecoq de Boisbaudran. (Review of work.)

Ann. Chim. Phys., (5), x, 100; Chem. Centrbl. (1877), 178; Gazz. Chim. Ital., vii, 332; Chem. News, xxxv, 148, 157, 167.

1878: (1). Lecoq de Boisbaudran and Jungfleisch. (Extraction.)

Compt. rend., lxxxvi, 475; Amer. J. Sci., (3), xv, 473; Phil. Mag., (5), v, 318; Jsb. (1878), 251; J. Chem. Soc. (Lond.), xxxiv, 374, 556, 837; Chem. Centrbl. (1878), 210; Chem. News, xxxvii, 121; Monit. Scientif. (1878), 290; Chem. Industrie (1878), 130; Wag. Jsb., xxiii, 9; xxiv, 5; Bull. Soc. Chim. (Paris), xxvii, 144; xxx, 501; Amer. Chemist, vii, 309.

1878: (2). Lecoq de Boisbaudran and Jungfleisch. (Properties of the metal.)

Compt. rend., lxxxvi, 577; Jsb. (1878), 253; Chem. Centrbl. (1878), 276; Chem. News, xxxvii, 142.

1878: (3). Lecoq de Boisbaudran. (Halogens.)

Comp. rend., lxxxvi, 756; Jsb. (1878), 254; Chem. Centrbl. (1878), 322.

1878: (4). Dupré. (Researches.)

Compt. rend., lxxxvi, 720; Amer. J. Sci., (3), xv, 474; Jsb. (1878), 254; Bull. Soc. Chim. (Paris), n. s., xxx, 503; J. Chem. Soc. (Lond.), xxxiv, 472; Chem. Centrbl. (1878), 322; Wag. Jsb., xxiv, 7; Chem. News, xxxvii, 184.

1878: (5). Berthelot. (Physical constants.)

Compt. rend., lxxxvi, 786; Amer. J. Sci., (3), xvii, 166; Phil. Mag., (5), vii, 75; Ann. Chim. Phys., (5), xv, 242; Jsb. (1878), 78; J. Amer. Chem. Soc., x, 279; J. Chem. Soc. (Lond.), xxxiv, 556; Chem. Centrbl. (1878), 353; Wag. Jsb., xxiv, 8.

1878: (7). Lecoq de Boisbaudran. (Equivalent.)

Comp. rend., lxxxvi, 756, 941; Bull Soc. Chim. (Paris), ii. s., xxix, 385; J. Amer. Chem. Soc., i, 320; J. Chem. Soc. (Lond.), xxxiv, 646; Wag. Jsb., xxiv, 8; Chem. Centrbl. (1878), 387; Chem. News, xxxvi, 216; Tidsskrift, (1), xvii, 144.

1878: (8). Lecoq de Boisbaudran. (Alloys with aluminum.)

Compt. rend., lxxxvi, 1249; Chem. Centrbl. (1878), 483; Chem. News, xxxvii, 274; Wag. Jsb., xxiv, 9.

1878: (9). Lecoq de Boisbaudran. (Atomic weight.)

Bull. Soc. Chim. (Paris), n. s., xxxii, 393; Amer. J. Sci., (3), xvi, 137; Jsb. (1878), 250; Chem. News, xxxvii, 138.

1878: (10). Regnauld. (Electrochemistry.)

Compt. rend., lxxxvi, 1457; Jsb. (1878), 135; Chem. Centrbl, (1878), 561; Wag. Jsb., xxv, 9.

1879: (1). Lockyer. (Heating of metal in vacuo.)

Chem. News, xl, 101; Jsb. (1879), 176; Compt. Rend., lxxxix, 514.

1879: (2). Jungfleisch. (Separation from blendes.)

Bull. Soc. Chim. (Paris), xxxi, 50; Ber., xii, 276, 382; Wag. Jsb., xxv, 9; Berg. u. Hüttenmannische Ztg. (1879), 206.

1880: (1). Schucht. (Electrolysis of salts.)

Chem. Ztg. (1880), 292; Berg. u. Hüttenmannische Ztg., xxxix, 121; Jsb. (1880), 174, 1143; Chem. News, xli, 280; Wag. Jsb., xxvi, 415.

1880: (2). Cornwall. (Occurrence in American blendes.)

Amer. Chem. J., ii, 44; Chem. Ztg. (1880), 443; Jsb. (1880), 327; J. Chem. Soc. (Lond.), xl, 997.

1881: (1). Clarke. (Atomic weight.)

Amer. Chem. J., iii, 263; Phil. Mag., (5), xii, 101; Jsb. (1881), 7.

1881: (2). Lecoq de Boisbaudran. (Anhydrous chlorides.)

Compt. rend., xciii, 294, 329, 815; Jsb. (1881), 221; Chem. Soc (Lond.), xl, 1103; xlii, 364; Chem. Centrbl. (1881), 645; (1882), 5; Chem. Ztg. (1881), 979.

1881: (3). Clarke. (Atomic weight.)

Amer. Chem. J., iii, 263; Phil. Mag., (5), xii, 101; Jsb. (1881), 7.

1882: (1). Lecoq de Boisbaudran. (Oxychloride.)

Compt. rend., xciv, 695; Jsb. (1882), 287; J. Chem. Soc. (Lond.), xlii, 698; Chem. Centrbl. (1882), 284; Chem. Ztg. (1882), vi, 266.

1882: (2). Lecoq de Boisbaudran. (Decomposition of protochloride.)

Compt. rend., xcv, 18; J. Chem. Soc. (Lond.), xlii, 1167.

1882: (3). Lecoq de Boisbaudran. (Precipitants.)

Comp. rend., xciv, 1154, 1228; Jsb. (1882), 1295; J. Chem. Soc. (Lond.), xlii, 897; Chem. Centrbl. (1882), 418.

1882: (4). Lecoq de Boisbaudran. (Separations.)

From Na., K., Li., Cs., Rb., Ba., Sr., Ca., Mg., Al., Cr.

Compt. rend., xciv, 1228; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Chem. Ztg. (1882), vi, 493.

From Be., Ce., Y., Fe., Th.

Comp. rend., xciv, 1439; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Chem. Centrbl. (1882), 519.

From Zr., Mn., Zn.

Compt. rend., xciv, 1625; xcix, 526; Jsb. (1882), 1295; Ann. Chim. Phys. (6), ii, 176; Chem. Centrbl. (1882), 519.

From Co., Ni., Tl.

Compt. rend., xcv, 157; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Bull. Soc. Chim. (Paris), xxxix, 547; Chem. Centrbl. (1882), 606.

From In., Cd.

Compt. rend., xcv, 410; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Bull. Soc. Chim. (Paris), xxxix, 547; Chem. Centrbl. (1882), 646.

From U., Pb.

Compt. rend., xcv, 503; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Bull. Soc. Chim. (Paris), xxxix, 547; Chem. Centrbl. (1882), 727.

From Sn., Sb., Bi., Cu., Hg., Ag., Au., Pt., Pd.

Compt. rend., xcv, 705, 1192, 1332; Jsb. (1882), 1295; Ann. Chim. Phys., (6), ii, 176; Bull. Soc. Chim. (Paris), xxix, 547; Chem. Centrbl. (1882) 826, (1883) 36, 130.

1883: (1). Lecoq de Boisbaudran. (Separations.)

From Rh., Ir., Ru., Os., As., Se.

Compt. rend., xcvi, 152, 1696, 1838; Ann. Chim. Phys., (6), ii, 176; Jsb. (1883), 1571; Bull. Soc. Chim. (Paris), xl, 350; xli, 353; Chem. Centrbl. (1883), 130, 501.

From Te., Si., Mo., V., W., P., Ti., Ta., Nb., Tr., Yt., Sc., F.

Compt. rend., 66, 142, 295, 521, 623, 730, 1463; Ann. Chim. Phys., (6), ii, 176; Bull. Soc. Chim. (Paris), xli, 353; xlii, 248; Jsb. (1883), 1571; Chem. Centrbl. (1883), 587, 678, 753, 861.

1883: (2). Donath and Mayrhofer. (Atomic volume.)

J. Chem. Soc. (Lond.), xlii, 1323; Ber., xvi, 1588; Jsb. (1883), 24.

1883: (3). Rabuteau. (Physiological effect.)

Compt. rend. de la Soc. de Rive (1883) 310, Chem. Centrbl. (1884), 64.

1884: (1). Lecoq de Boisbaudran. (Separations.)
From B. (Organic matter.)

Compt. rend., xcviii, 711, 781; Ann. Chim. Phys., (6), ii, 176; Jsb. (1884), 1600; Chem. Centrbl. (1884), 419; Chem. Ztg. (1884), 1040.

1884: (2). Lecoq de Boisbaudran. (Solubility of the ferrocyanide.)

Compt. rend., xcix, 526; Jsb. (1884), 1602.

1884: (3). Carnelly. (Relation of color to atomic weight.)

Phil. Mag., (5), xviii, 130; Ber. (1884), 2151; Chem. News, l, 193; Jsb. (1884), 43.

1884: (4). Clarke. (Atomic weight.)

Chem. News, xlix, 260, 273; Chem. Ztg. (1884), 930.

1885: (1). Ehrlich. (Extraction.)

Chem. News, li, 115; Chem. Ztg. (1885), 78; Jsb. (1885), 496.

1885: (2). Lecoq de Boisbaudran. (Alloys with indium.)

Compt. rend., c, 701; Chem. News, li, 165; Jsb. (1885), 496; Chem. Centrbl. (1885), 297; Chem. Ztg. (1885), i, 470.

1885: (3). Gladstone. (Refraction equivalent.)

Phil. Mag., (5), xx, 162; Jsb. (1885), 310.

1885: (4). Kunert. (Extraction.)

Chem. Ztg. (1885), ix, 1826; Ber., xix, 74; Jsb. (1885), 496.

1886: (1). Lecoq de Boisbaudran. (Identity with austrium.)

Compt. rend., cii, 647, 1436; Jsb. (1886), 407; Dingl. Pol. J., cclxi, 96; Wag. Jsb., xxxii, 224.

1886: (2). Lecoq de Boisbaudran. (Estimation.)

Ann. Chim. Phys., (6), xi, 429.

1886: (3). Willgeroot. (As halogen transferrer.)

J. Prakt. Chem., xxxv, 142, 391; Jsb. (1887), 618; Bull. Soc. Chim. (Paris), xlviii, 346; J. Chem. Soc. (Lond.), lii, 326; Chem. Ztg. Rep., 1887, 43; Chem. Centrbl. (1887), 507.

1887: (1). Lecoq de Boisbaudran. (Red fluorescence of the oxide with chromium.)

Compt. rend., civ, 330, 1584; Chem. News, lvi, 12; Ber., xx, 456r; Jsb. (1887), 358.

1887: (2). Lecoq de Boisbaudran. (Volatility of the chloride.)

Ann. Chim Phys. (1887), (6), xi,' 420; Chem. Ztg. Rep. (1887), 186.

1888: (1). Lecoq de Boisbaudran. (Fluorescence of compounds.)

Compt. rend., cv, 1228; Chem. Centrbl. (1888), 462.

1888: (2). Friedel and Crafts. (Vapor density of the chloride.)

Compt. rend., cvii, 306; J. Chem. Soc. (Lond.), liv, 1250; liii, 825; Chem. Centrbl. (1888), 1167; Chem. Ztg. Rep. (1888), 213.

1888: (3). NILSON and PETTERSSON. (Valence and the chloride.)

Compt. rend, CVII, 527; Ber., XXI, 691R; Jsb. (1888), 572; Chem. Centrbl. 1888), 1328; Chem. Ztg. Rep. (1888), 261; Bull. Soc. Chim. (Paris), (3), I, 724.

1889: (1). BARTLETT. (Occurrence.)

Chem. Soc. Ind. J., VIII, 896; Jsb. (1889), 341.

1889: (2). RAMSAY. (Molecular weight.)

J. Chem. Soc. (Lond.), LV, 531.

1890: (1). WINKLER. (Reduction of the oxide by magnesium.)

Ber., XXIII, 788; J. Chem. Soc. (Lond.), LVIII, 693.

1891: (1). CLARKE. (Atomic weight.)

Chem. News, LXIII, 76; Jsb. (1891), 79.

1892: (1). LECOQ DE BOISBAUDRAN. (Spark spectrum.)

Compt. rend., CXIV, 815; Jsb. (1892), 456; J. Chem. Soc. (Lond.), LXII, 930; Chem. Centrbl. (1892), I, 810.

1893: (1). WILDE. (Spectrum.)

Proc. Roy. Soc., LIII, 369; Jsb. (1893), 151.

1893: (2). GLADSTONE. (Molecular refraction and dispersion.)

Phil. Mag., XXXV, 365; Ber., XXV, 357R; Chem. News, LXVII, 94; Jsb. (1893), 42.

1893: (3). KIRTLAND. (Occurrence in Australian blendes.)

Australian Assoc. Adv. Sci. (1893), 266; J. Chem. Soc. (Lond.), LXX, 183.

1895: (1). LECOQ DE BOISBAUDRAN. (Atomic weight.)

Compt. rend., CXX, 361.

1896: (1). HARTLEY and RAMAGE. (Occurrence.)

Lond. Roy. Soc. Proc., LX, 35; Amer. J. Sci., (4), II, 378; Jsb. (1896), 554; J. Soc. Chem. Indust., XVI, 367.

1897: (1). HARTLEY and RAMAGE. (Occurrence.)

J. Chem. Soc. (Lond.), LXXI, 533; Bull. Soc. Chim. (Paris), (3), XXVI, 951.

1897: (2). WINKLER. (History of the discovery.)

Ber., XXX, 13.

1897: (3). WYRUBOFF. (Silico-tungstate.)

Bull. Soc. Franc. Min., xix, 219; J. Chem. Soc. (Lond.), LXXII, 173.

1898: (1). LANDOLT, OSWALD, and SEUBERT. (Atomic weight.)

Ber., XXXI, 2762.

1898: (2). Hartley and Ramage. (Occurrence in iron ores, etc.)

Lond. Roy. Soc. Proc., lx, 393; J. Chem. Soc. (Lond.), lxxiv, 236; Chem. Centrbl. (1897), i, 455; Ztschr. anorg. chem., xviii, 232; Dublin Roy. Soc. Proc., n. s., viii, 703.

1899: (1). Meyer. (Magnetic properties.)

Monatsh. f. Chem., xx, 380.

1899: (2). Hartley and Ramage. (Spectrum.)

Astrophy. J., ix, 214.

1901: (1). Hartley and Ramage. (Occurrence.)

Lond. Roy. Soc. Proc., lxviii, 99; Dublin Roy. Soc. Sci. Trans., vii; Amer. J. Sci., (4), xi, 323.

1904: (1). Rimatori. (Occurrence in Sardinian blendes.)

Atti. R. Accad. dei Lincei Roma, (5), xiii, i, 277, Chem. Centrbl. (1904), i, 1370.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS

PART OF VOLUME XLVI

INDEX TO THE LITERATURE
OF
GERMANIUM

1886-1903

PREPARED BY
PHILIP E. BROWNING

(No. 1544)

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1904

LETTER OF TRANSMITTAL.

WASHINGTON AND LEE UNIVERSITY,
DEPARTMENT OF CHEMISTRY,
LEXINGTON, VA., *October 18, 1904.*

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the following:

INDEX TO THE LITERATURE OF GALLIUM, 1875–1903;

INDEX TO THE LITERATURE OF GERMANIUM, 1886–1903;

both prepared by Philip E. Browning, Ph. D., of the Kent Chemical Laboratory of Yale University.

JAS. LEWIS HOWE,
Chairman.

MR. S. P. LANGLEY,
Secretary of the Smithsonian Institution.

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INDEX TO THE LITERATURE OF GERMANIUM.

(1886-1903.)

PREPARED BY PHILIP E. BROWNING.

1886: (1). Winkler. (Discovery.)

Ber., xix, 210; Chem. News, liii, 127; J. Chem. Soc. (Lond.), l, 421, Chem. Ztg., x, 212, 237, 676; Amer. Chem. J., ix, 71: Ztschr. Anal. Chem., xxv, 226; Ding. Pol. J., cclix, 474; Bull. Soc. Chem. (Paris), xlvi, 320; Wag. Jsb., xxxiii, 223; Chem. Centrbl. (1886), 242: Amer. J. Sci., (3), xxxi, 308; J. de. Pharm., (5), xiii, 335.

1886: (2). Lecoq de Boisbaudran. (Atomic weight and spectrum.)

Compt. rend., cii, 1291; Ber., xix, 479r; Jsb. (1886), 47; Chem. News, liv, 4; J. Chem. Soc. (Lond.), l, 768; Chem. Ztg. Rep. (1886), 137.

1886: (3). Winkler. (Extraction, properties of element, salts, etc.)

J. Prakt. Chem., (2), xxxiv, 177; Ber., xix, 625r; Jsb. (1886), 374; Chem. Ztg. (1886), 1057; Chem. News, liv, 136; J. Chem. Soc. (Lond.), l, 985; Bull. Soc. Chim. (Paris), xlvi, 644; J. de Pharm., (5), xiv, 478; Wag. Jsb., xxxii, 223; Chem. Centrbl. (1886), 770, 771.

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Chem. News, liv, 49.

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Ber., xxi, 131; Jsb. (1888), 546; J. Chem. Soc. (Lond.), liv, 345; Chem. Ztg. (1887), 1638; Bull. Soc. Chim. (Paris), xlix, 628; Amer. J. Sci., (3), xxxv, 410; Chem. Centrbl. (1888), xix, 275.

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Chem. News, lxiii, 76; Jsb. (1891), 79.

1891: (2). NEUMANN. (Germanium in tin compounds.)
Monatsh. f. Chem., XII, 515.

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1863-1903

PREPARED BY
PHILIP E. BROWNING, PH. D.
of the Kent Chemical Laboratory of Yale University

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(1863-1903.)

PREPARED BY PHILIP E. BROWNING.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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INDEX TO THE LITERATURE
OF
THALLIUM,

1861–1896.

BY

MARTHA DOAN.

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by Miss Martha Doan.

H. CARRINGTON BOLTON, *Chairman.*

MR. S. P. LANGLEY,
Secretary of the Smithsonian Institution.

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BY MARTHA DOAN.

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1863 : 20. GRANDEAU. (Poisonous properties of Tl.)

Instit., 1863, 333 ; Jsb., 1863, 256.

1863 : 21. R. BÖTTGER. (Method of obtaining Tl. from lead-chamber deposits. Some Tl. compounds.)

Jsb. des Frank. phys. Ver., 1861–62, 58 ; Ann. Chem. Liebig, **127**, 175 ; J. prakt. Chem., **90**, 22 ; Vierteljahrsschr. pr. Phar., **12**, 365 ; Chem. Centrbl., 1863, 404 ; Dingl. pol. J., **168**, 438 ; Ann. chim. phys. [3], **78**, 500 ; Bull. Soc. chim., **5**, 451 ; Jsb., 1863, 45.

1863 : 22. SCHRÖTTER. (Occurrence in lepidolite and mica.)

Wien. Akad. Ber. [2]. **48**, 734 ; J. prakt.Chem., **91**, 45 ; Chem.Centrbl., 1864, 864 ; Instit., 1864, 70 ; Chem. News, **9**, 169 ; Jsb., 1864, 245.

1863 : 23. V. v. LANG. (Crystal form and optical properties of Tl_2SO_4.)

Phil. Mag. [4], **25**, 248 ; Ann. Chem. Liebig, **128**, 76 ; Ann. der Phys. Pogg., **118**, 630 ; Bull. Soc. chim., **5**, 453 ; Chem. Centrbl., 1864, 144 ; Jsb., 1863, 254.

1864 : 1. G. Werther. (Determination as iodide.)

Zeitschr. anal. Chem., **3**, 1 ; J. prakt. Chem., **93**, 393 ; Chem. Centrbl., 1864, 987 ; J. Pharm. [3], **46**, 306 ; Jsb., 1864, 712.

1864 : 2. A. Lamy. (Alcoholates.)

Ann. chim. phys. [4], **3**, 373 ; Compt. rend., **59**, 780 ; Instit., 1864, 370 ; J. Pharm. [4], **1**, 211 ; Chem. News, **10**, 268 ; Chem. Centrbl., 1865, 303 ; Am. J. Sci. [2], **39**, 220 ; Jsb., 1864, 463.

1864 : 3. W. Crookes. (Oxalates.)

Chem. News, **9**, 1 ; Bull. Soc. chim. [2], **1**, 278 ; Chem. Centrbl., 1864, 410 ; Jsb., 1864, 254.

1864 : 4. W. Crookes. (Solubility of Tl. salts.)

Chem. News, **9**, 37 ; Bull. Soc. chim. [2], **1**, 266 ; Jsb., 1864, 256.

1864 : 5. Erdmann. (Action of Thallium carbonate on vegetable colors.)

J. prakt. Chem., **91**, 317 ; Chem. Centrbl., 1864, 941 ; J. Pharm. [3], **46**, 463 ; Jsb., 1864, 250.

1864 : 6. Schönbein. (Behavior of Tl. in presence of O and H_2O_2.)

J. prakt. Chem., **93**, 35 ; Bull. Soc. chim. [2], **3**, 180 ; Jsb., 1864, 170.

1864 : 7. A. Schrötter. (Separation of Li., Rb., Cs., and Tl. in lepidolite and mica.)

Wien. Akad. Ber. [2], **50**, 268 ; J. prakt. Chem., **93**, 275 ; N. Jahr. Pharm., **23**, 16, 65 ; Chem. Centrbl., 1865, 331 ; Jsb., 1864, 186.

1864 : 8. J. Nickles. (Spectrum.)

Compt. rend., **58**, 132 ; Instit., 1864, 11 ; Bull. Soc. chim. [2], **1**, 454 ; J. prakt. Chem., **92**, 505 ; Ann. der Phys. Pogg., **121**, 336 ; Chem. Centrbl., 1864, 404 ; Chem. News, **9**, 54 ; Phil. Mag. [4], **28**, 168 ; Jsb., 1864, 246.

1864 : 9. Oettinger. (Molybdate and wolframate.)

Zeitschr. Chem. Pharm., 1864, 440 ; J. Pharm. [3], **46**, 463 ; Jsb., 1864, 253.

1864 : 10. Bischoff. (Occurrence.)

Ann. Chem. Liebig, **129**, 375 ; Dingl. pol. J., **172**, 73 ; Chem. Centrbl., 1864, 815 ; Bull. Soc. chim. [2], **1**, 349 ; J. Pharm. [3], **46**, 308 ; Jsb., 1864, 245.

1864 : 11. Kuhlmann. (Thallous fluoride.)

Compt. rend., **58**, 1037 ; Bull. Soc. chim. [2], **3**, 57 ; Chem. News, **10**, 37 ; Jsb., 1864, 253.

1864 : 12. Crookes. (Spectrum.)

Chem. News, **9**, 54 ; Jsb., 1864, 246.

1864 : 13. WERTHER.

J. prakt. Chem., **91**, 385 ; **92**, 128, 351 ; Chem. Centrbl., 1864, 737 ; Bull. Soc. chim. [2], **2**, 272 ; **3**, 58 ; J. Pharm. [3], **46**, 463 ; Chem. News, **10**, 278 ; Jsb., 1864, 246.

1864 : 14. WILLM.

Bull. Soc. chim. [2], **2**, 89 ; Jsb., 1864, 250.

1864 : 15. J. NICKLES. (Chloro- and bromo-ethers of Tl.)

Compt. rend., **58**, 537 ; Instit., 1864, 89 ; J. Pharm. [4], **1**, 22 ; Bull. Soc. chim. [2], **1**, 467 ; Chem. News, **9**, 241 ; J. prakt. Chem., **92**, 301 ; Chem. Centrbl., 1864, 412 ; Jsb., 1864, 252.

1865 : 1. WILLM.

Ann. chim. phys. [4], **5**, 5 ; Bull. Soc. chim. [2], **4**, 166 ; Zeitschr. Chem., 1865, 488 ; Jsb., 1865, 242.

1865 : 2. STRENG. (Occurrence in furnace products.)

Dingl. pol. J., **177**, 329 ; Zeitschr. Chem., 1866, 95 ; Jsb., 1865, 242.

1865 : 3. R. BUNSEN.

Ann. Chem. Liebig, **133**, 108 ; Zeitschr. Chem., 1865, 106 ; Dingl. pol. J., **175**, 244 ; Viertschr. Pharm., **14**, 592 ; Chem. Centrbl., 1866, 31 ; Ann. chim. phys. [4], **4**, 499 ; Bull. Soc. chim. [2], **3**, 418 ; Phil. Mag. [4], **29**, 168 ; Jsb., 1865, 242.

1865 : 4. REID.

Chem. News, **12**, 242 ; Zeitschr. Chem., 1866, 64 ; Jsb., 1865, 243.

1865 : 5. BUCHNER. (Fluorides.)

Wien. Akad. Ber. [2], **52**, 644 ; J. prakt. Chem., **94**, 404 ; Chem. Centrbl., 1866, 240 ; Jsb., 1865, 244.

1865 : 6. W. H. MILLER. (Crystalline form.)

Proc. Roy. Soc., **14**, 555 ; Phil. Mag. [4], **31**, 149 ; Jsb., 1865, 244.

1865 : 7. A. LAMY. (Phosphorus compounds.)

Compt. rend., **60**, 741 ; Bull. Soc. chim. [2], **4**, 193 ; Jour. Pharm. [4], **1**, 431 ; Zeitschr. Chem., 1865, 388 ; Chem. Centrbl., 1865, 597 ; Phil. Mag. [4], **29**, 379 ; Ann. chim. phys. [4], **5**, 410 ; Jsb., 1865, 246.

1865 : 8. HEBBERLING. (Estimation of Tl.)

Ann. Chem. Liebig, **134**, 11 ; Chem. Centrbl., 1865, 657 ; N. Arch. ph. nat., **23**, 113 ; Jsb., 1865, 249.

1865 : 9. A. STRECKER. (Some Thallic salts.)

Ann. Chem. Liebig, **135**, 207 ; J. prakt. Chem., **96**, 334 ; Chem. Centrbl., 1865, 881 ; J. Pharm. [4], **2**, 340 ; Phil. Mag. [4], **30**, 256 ; Chem. News, **12**, 136 ; Am. Jour. Sci. [2], **41**, 114 ; Jsb., 1865, 252.

1866 : 1. NICKLES. (Behavior toward mercury.)

J. Pharm. [4], **4**, 127 ; Jsb., 1866, 238.

1866 : 2. H. E. Roscoe. (Thallous perchloride.)

Chem. Soc. J. [2], 4, 127 ; Chem. News, 14, 217, 242 : J. prakt. Chem., 101, 56 ; Zeitschr. Chem., 1866, 753 : N. Arch. ph. nat., 28, 176 ; Jsb., 1866, 238.

1866 : 3. Birnbaum. (Action of H_2O_2 on Tl.)

Ann. Ch. u. Pharm., 138, 133 ; Jsb., 1866, 239.

1866 : 4. Bunsen. (Spectrum.)

Jsb., 1866, 779.

1866 : 5. Lamy. (Tl. Glass, Tl. and Pb. Glass.)

Bull. Soc. chim. [2], 5, 164 ; Instit., 1866, 320 : Zeitschr. Chem., 1866, 251 : Chem. Centrbl., 1866, 799 ; 1867, 432 ; Phil. Mag. [4], 32, 385 ; Jsb., 1866, 865.

1866 : 6. Debray. (Thallium phosphomolybdate.)

Bull. Soc. chim. [2], 5, 404 ; Zeitschr. Chem., 1866, 478 ; Zeitschr. anal. Chem., 5, 381 ; J. prakt. Chem., 100, 64 ; Chem. Centrbl., 1866, 880 ; Vierteljahrschr. pr. Pharm., 16, 425 ; Jsb., 1866, 794.

1866 : 7. Böttger. (Behavior of Tl. towards S. and sulphide of gold.)

Jsb. phys. Ver. Frankfurt-a-M., 1865–66, 56 ; Jsb., 1866, 860.

1866 : 8. Streit.

J. prakt. Chem., 100, 191 ; Zeitschr. Chem., 1867, 384 ; Chem. Centrbl. 1867, 623 ; Jsb., 1867, 279.

1867 : 1. Crookes. (Behavior of Tl. salts in presence of $KMnO_4$.)

Chem. News, 15 ; Zeitschr. Chem., 1867, 412 : Bull. Soc. chim. [2], 7, 394 ; N. Arch. ph. nat., 29 [?], 179 ; Jsb., 1867, 250.

1867 : 2. Wöhler. (Preparation from pyrites.)

Ann. Ch. Pharm., 142, 263 ; Bull. Soc. chim. [2], 9, 462 ; Phil. Mag., 34, 222 ; Jsb., 1867, 274.

1867 : 3. Regnauld. (Amalgams.)

Compt. rend., 64, 611 : Instit., 1867. 109 ; J. Pharm. [4], 5, 251 ; J. prakt. Chem., 101, 255 ; Zeitschr. Chem., 1867, 349 ; Bull. Soc. chim. [2], 8, 179 ; Jsb., 1867. 275.

1867 : 4. Otto. (Position among the elements.)

J. prakt. Chem., 102, 185 ; Bull. Soc. chim. [2], 9, 212 : Jsb., 1867, 275.

1867 : 5. Carstanjen. (Thallium and its compounds.)

J. prakt. Chem., 102, 65, 129 ; Zeitschr. Chem., 1868, 69 ; Jsb., 1867, 275.

1867 : 6. Wöhler. (Thallous chloride.)

Ann. Chem. Liebig, 144, 250 ; J. prakt. Chem., 104, 127 ; Zeitschr. Chem., 1868, 124 ; Bull. Soc. chim. [2], 9, 463 ; Jsb., 1867, 281.

1867 : 7. Carstanjen. (Thallium acids.)

J. prakt. Chem., **101**, 55 ; Am. Jour. Sci. [2], **44**, 269 ; Jsb., 1867, 282.

1867 : 8. F. Ullek. (Tl. molybdanoxy-fluoride.)

Ann. Chem. Liebig, **144**, 204, 320 ; Wien. Akad. Ber. [2], **55**, 767 ; J. prakt.Chem., **101**, 61: Chem.Centrbl., 1867, 977: [Wien. Akad. Anz., 1867, 108] : N. Arch. ph. nat., **31**, 152 ; Jsb., 1867, 236.

1867 : 9. Lamy. (Thallium.)

Wien Akad. Anz., 1867, 137 ; J. prakt. Chem , **101**, 61 ; Instit., 1867, 384 ; Jsb., 1867, 921.

1867 : 10. S. Mellor. (Tl. and Mg. alloy.)

Chem. News, **15**, 245 ; J. prakt. Chem., **103**, 508 : Zeitschr. Chem., 1867, 475 ; Bull. Soc. chim. [2], **8**, 259 ; Jsb., 1867, 896.

1868 : 1. Wöhler. (Oxidation of Tl. in the circuit of a galvanic current.)

Ann. Chem. Liebig, **146**, 263, 375 ; Zeitschr. Chem., 1868, 385 ; Chem. Centrbl., 1868, 889 ; Bull. Soc. chim. [2], **10**, 352 ; Jsb., 1868, 193.

1868 : 2. J. W. Gunning. (Extraction of Thallium.)

Scheikundige bijdragen uit het Laboratorium van het Athenæum illustre te Amsterdam, I., 95 : Arch. neerlandaises des sci. exactes et nat., III., 86 ; Zeitschr. Chem., 1868, 370 ; Zeitschr. anal. Chem., **7**, 480 ; J. prakt. Chem., **105**, 343 ; Bull. Soc. chim. [2], **10**, 359 ; Chem. News, **17**, 138 ; Jsb., 1868, 247.

1868 : 3. Lamy and Des Cloizeaux. (Chem., opt. and cryst. study of salts of Tl.)

Comptes. rend., **66**, 1146 ; Ann. chem. phys. [4], **17**, 310, 434 ; Jsb., 1868, 252.

1868 : 4. H. Flemming. (Molybdate and silicate of Tl.)

Jenaische Zeitschr. f. Med. u. Naturw., **4**, 33 ; Zeitschr. Chem., 1868, 292 ; Bull. Soc. chim. [2], **10**, 235 ; Jsb., 1868, 250.

1869 : 1. H. Fizeau. (Heat expansion of Thallium.)

Compt. rend., **68**, 1125 : Ann. der Phys. Pogg., **138**, 26 ; Jsb., 1869, 86.

1869 : 2. H. C. Sorby. (Borax-bead reaction for Thallium.)

Chem. News, **19**, 309 ; Ber., **2**, 337 ; Zeitschr. anal. Chem., **9**, 100 ; Jsb., 1869, 912.

1869 : 3. A. Lamy. (Thallous oxide paper as a reagent for ozone.)

Bull. Soc. chim. [2], **11**, 210 ; Zeitschr. Chem., 1869, 416 ; Chem. Centrbl., 1869, 272 ; Ber., **2**, 60 ; Zeitschr. anal. Chem., **9**, 74 ; Jsb., 1869, 194.

1869 : 4. Zschiesche. (Double sulphides of Thallium with cerium and didymium.)

J. prakt. Chem., **107**, 98.

1869 : 5. Lamy and Des Cloizeaux. (Chemical and optical study of Thallium salts.)

Ann. chim. phys. [4], **17**, 310.

1869 : 6. Angström. (Thallium spectrum.)

Ann. chim. phys. [4], **18**, 235.

1870 : 1. Böttger. (Preservation of lustre of Thallium under water.)

Dingl. poly. J., **197**, 379 ; Chem. Centrbl., 1870, 623 ; Jsb., 1870, 355.

1870 : 2. C. Rammelsberg. (Isomorphism of Thallium phosphate with alkali phosphates. Position among the elements.)

Ber., **3**, 276 ; Zeitschr. Chem. [2], **6**, 570 ; Jsb., 1870, 356 ; Chem. Centrbl., 1871, 14.

1870 : 3. C. Rammelsberg. (Iodate and some double halides of Thallium.)

Ber., **3**, 360 ; Zeitschr. Chem. [2], **6**, 606 ; Chem. Centrbl., 1872, 595 ; Jsb., 1870, 356.

1870 : 4. Chr. Hansen. (Ethyl compounds of Thallium.)

Ber., **3**, 9 ; Zeitschr. Chem. [2], **6**, 310 ; Chem. Centrbl., 1870, 82 ; Jsb., 1870, 507.

1870 : 5. R. Schneider and K. Preiss. (Thallium sulpho-platinate.)

Ann. der Phys. Pogg., **138**, 604 ; J. prakt. Chem. [2], **2**, 162 ; Chem. Centrbl., 1870, 107.

1870 : 6. Cossa. (Thallium alum.)

Nuovo Cimento [2], **3**, 75 ; Zeitschr. Chem. [2], **6**, 380 ; Chem.Centrbl., 1870, 470.

1871 : 1. A. Cornu. (Thallium spectrum.)

Compt. rend., **73**, 332 ; N. Arch. ph. nat., **42**, 85 ; Phil. Mag. [4], **42**, 237 ; Jsb., 1871, 174.

1871 : 2. R. J. Friswell. (Double cyanide of Thallium and platinum.)

J. Chem. Soc., **24**, 461 ; Ann. Chem. Liebig, **159**, 383 ; Zeitschr. Chem. [2], **7**, 414 ; Chem. News, **23**, 249 ; Bull. Soc. chim. [2], **16**, 87 ; Ber., **4**, 529 ; Chem. Centrbl., 1871, 386 ; Jsb., 1871, 317.

1871 : 3. Max Schaffner. (Preparation of Thallium in large amounts.)

Wien. Acad. Ber. [2], **63**, 176 ; Chem. Centrbl., 1871, 594 ; Jsb., 1871, 987.

1871 : 4. F. v. Kobell. (Occurrence in sphalerite.)

J. prakt. Chem. [2], **3**, 176 ; J. Chem. Soc., **24**, 312 ; Zeitschr. anal. Chem., **11**, 81 ; Chem. Centrbl., 1871, 308.

1871 : 5. J. Thomsen. (Heat of neutralization of Thallium oxide.)

Ann. der Phys. Pogg., **143**, 354 ; **143**, 497 ; Ber., **4**, 309 and 588 ; Bull. Soc. chim. [2], **16**, 63 ; Jsb., 1871. 104.

1871 : 6. ———. (Thallium in pigments.)

Monit. scientif., 1871, 723; Deutsch Industriezt., 1871, 418; Jsb. Chem. Tech., 1872, 7.

1872 : 1. F. Wöhler. (Preparation of metallic Thallium.)

Ann. Chem. Liebig, **164**, 74; J. Chem. Soc., **25**, 880; Bull. chim. Soc. [2], **18**, 448; Jsb. Chem. Tech., 1873, 5; Chem. Centrbl., 1872, 658; Jsb., 1872, 254.

1872 : 2. W. Crookes. (Atomic weight of Thallium.)

Proc. Roy. Soc., **20**, 475; Chem. News, **26**, 231; Ber., **5**, 940; Zeitschr. anal. Chem., **13**, 35; J. Chem. Soc., **26**, 355; Chem. Centrbl., 1873, 62; Jsb., 1872, 254.

1872 : 3. M. Jorgensen. (Thallous-thallic iodide.)

J. prakt. Chem. [2], **6**, 82; Bull. Soc. chim. [2], **18**, 312; J. Chem Soc., **26**, 475; Jsb., 1872, 254.

1872 : 4. Rammelsberg. (Isomorphism of Thallium salts with those of univalent elements.)

Ann. der Phys. Pogg., **146**, 592; J. Chem. Soc., **25**, 987.

1872 : 5. Bolton. (Thallium uranate.)

Amer. Chemist., 1872, **2**, 456; Jsb., 1872, 255.

1872 : 6. G. Spezia. (Determination of iodine in presence of chlorine by Thallous nitrate.)

Zeitschr. anal. Chem., **11**, 397; Chem. Centrbl., 1873, 183.

1873 : 1. L. de Boisbaudran. (Spectrum of Thallium.)

Compt. rend., **77**, 1152; Jsb., 1873, 152.

1873 : 2. Carnelly. (Vanadates of Thallium.)

J. Chem. Soc., **26**, 323; Ann. Chem. Liebig, **166**, 155; Ber., **6**, 74; Chem. Centrbl., 1873, 226; Jsb., 1873, 279.

1873 : 3. C. A. Valson. (Refraction of Thallium salt solutions.)

Compt. rend., **76**, 224; Gazz. chim. ital., 1873, 134; Jsb., 1873, 135.

1873 : 4. Stolba. (Separation of Thallium from flue dust. Thallium alum.)

Ber. der. Königl. böhm Ges. d. Wissen, 1873, Nov.; J. Chem. Soc., **27**, 873; Chem. Centrbl., 1874, 118; Jsb., 1873, 282.

1873 : 5. Rammelsberg. (Hypophosphite of Thallium.)

J. Chem. Soc., **26**, 2.

1873 : 6. C. Fronmüller. (Thallous cyanide.)

Ber., **6**, 1178; J. Chem. Soc., **27**, 147.

1874 : 1. Phipson. (Determination of Thallium.)

Compt. rend., **78**, 563; J. Chem. Soc., **27**, 662; Chem. Centrbl., 1874, 235; Jsb., 1874, 996.

1874 : 2. F. C. Hartwig. (Compounds of Thallium with alcohol radicals.)

Ber., **7**, 298 ; J. Chem. Soc., **27**, 675 ; Chem. Centrbl., 1874, 296.

1874 : 3. Carius and Fronmüller. (Thallium triethyl.)

Ber., **7**, 302 ; Chem. Centrbl., 1874, 296.

1874 : 4. Th. Knösel. (Iodine compounds of Thallium.)

Ber., **7**, 576 and 893 ; J. Chem. Soc., **27**, 775.

1874 : 5. H. Schröder. (Isomorphism of Thallium and ammonium salts.)

Ber., **7**, 676.

1874 : 6. Troost and Hautefeuille. (Behavior of Thallium toward hydrogen.)

Ann. chim. phys. [5], **2**, 279 ; Compt. rend., **78**, 807 ; Dingl. poly. J., **214**, 236 ; Jsb., 1874, 239.

1875 : 1. J. Thomsen. (Thermo-chemical study of some Thallium compounds.)

J. prakt. Chem., **12**, 98 ; Bull. Soc. chim., **26**, 150 ; Chem. Centrbl., 1875, 578 ; Jsb., 1875, 83.

1875 : 2. R. Schneider. (Thallium-sodium sulphide.)

Ann. der Phys. Pogg., **153**, 588 ; J. Chem. Soc., **28**, 533.

1875 : 3. H. Lescoeur. (Diacetate of Thallium.)

Bull. Soc. chim., **24**, 516 ; Chem. Centrbl., 1876, 35.

1875 : 4. Hammerbacher. (Occurrence of Thallium in carnallite.)

Ann. Chem. Liebig, **176**, 82 ; J. Chem. Soc., **28**, 734 ; Chem. Centrbl., 1875, 230.

1875 : 5. F. Hartwig. (Thallium in union with alcohol radicals.)

Ann. Chem. Liebig, **176**, 257 ; J. Chem. Soc., **28**, 1002.

1875 : 6. J. Krause. (Preparation of Thallium.)

Dingl. poly. J., **217**, 323 ; J. Chem. Soc., **28**, 519 ; Chem. Centrbl., 1875, 643 ; Jsb., 1875, 216.

1875 : 7. R. Nietzki. (Preparation of Thallium.)

Arch. Pharm. [3], **7**, 385 ; Chem. Centrbl., 1877, 778 ; Jsb., 1875, 216.

1875 : 8. R. Böttger. (Behavior of Thallic oxide toward "Goldschwefel.")

N. Rep. Pharm., **24**, 243 ; Pol. Notizbl., **33**, 31 ; Chem. Centrbl., 1878, 271 ; Jsb., 1875, 216.

1876 : 1. T. E. Thorpe. (Isometric relations of Thallium.)

J. Chem. Soc., **29**, 859 ; Ber., **9**, 952 ; Chem. News, **33**, 156 ; Chem. Centrbl., 1876, 466.

1876 : 2. JOHN MUIR. (Thallium chlorate.)

J. Chem. Soc., **29**, 857 ; Ber., **9**, 952 ; Chem. News, **33**, 156 ; Chem. Centrbl., 1876, 466 ; Jsb., 1876, 258.

1876 : 3. E. J. CHAPMAN. (Blowpipe reactions of Thallium.)

Phil. Mag. [2], **2**, 397 ; J. Chem. Soc., **31**, 489 ; Chem. News, **35**, 13 ; Jsb., 1876, 995.

1876 : 4. R. NIETZKI. (Preparation and determination of Thallium.)

Dingl. poly. J., **219**, 262 ; Zeitschr. anal. Chem., **16**, 472 ; 'Jsb., 1876, 1072 ; Jsb., 1877, 1069.

1876 : 5. C. FRONMÜLLER. (Double cyanides of Thallium.)

Inaug. dis. Marburg, 1876 ; Jsb., 1876, 316.

1877 : 1. R. J. FRISWELL and A. J. GREENAWAY. (Thallous platinocyanide.)

J. Chem. Soc., **32**, 251 ; Ber., **10**, 1858 ; Chem. News, **35**, 272 ; Bull. Soc. chim., **30**, 120 ; Chem. Centrbl., 1877, 548 ; Jsb., 1877, 314.

1877 : 2. J. J. ACKWORTH and H. E. ARMSTRONG. (Action of nitric acid on Thallium.)

J. Chem. Soc., **32**, 86.

1877 : 3. PETER CLAESSON. (Thallium mercaptide.)

J. prakt. Chem., **15**, 193 ; J. Chem. Soc., **32**, 294 ; Jsb., 1877, 519.

1877 : 4. H. KUPFERBERG. (Thallium salicyl-anilid.)

J. prakt. Chem., **16**, 434 ; J. Chem. Soc., **34**, 319 ; Jsb., 1877, 753.

1878 : 1. H. E. ROSCOE. (Density of vapor of Thallous chloride.)

Ber., **11**, 1196 ; J. Chem. Soc., **34**, 937 ; Chem. Centrbl., 1878, 594.

1878 : 2. C. FRONMÜLLER. (Some double salts of Thallous cyanide.)

Ber., **11**, 91 ; Bull. Soc. chim., **30**, 339 ; J. Chem. Soc., **34**, 394 ; Chem. Centrbl., 1878, 178 ; Jsb., 1878, 291.

1878 : 3. A. COSSA. (Thallium alum in volcanic regions.)

Acad. dei Lincei, S., III., **2** ; Gazz. chim. ital., 1878, 235 ; Zeitschr. Kryst., **2**, 509 ; Ber., **11**, 811 ; Jsb., 1878, 1225.

1878 : 4. F. W. CLARKE. (Thallous tellurate.)

Ber., **11**, 1507 ; Am. J. Sci. [3], **6**, 201 ; J. Chem. Soc., **36**, 1004.

1878 : 5. L. F. NILSON. (Thallium plato-iodo-nitrite.)

Ber., **11**, 881.

1878 : 6. T. W. SALTER. (Thallium chromates as pigments.)

Chem. News, **37**, 96 ; J. Chem. Soc., **34**, 454 ; Jsb., 1878, 291.

1878 : 7. E. SCHONE. (Oxygen compounds of Thallium and Hydrogen peroxide.)

Ann. Chem. Liebig, **196**, 58 ; Bull. Soc. chim., **29**, 538 ; Jsb., 1878, 196.

1878 : 8. G. Ciamician. (Spectrum of Thallium.)
Ber. Wien. Acad. [2], **76**, 499.

1878 : 9. Liveing and Dewar. (Spectrum of Thallium.)
Proc. Roy. Soc., **27**, 132 ; **27**, 350 ; **27**, 494 ; Jsb., 1878, 182.

1879 : 1. A. Ditte. (Acid Thallium nitrate.)
Compt. rend., **89**, 576 ; Chem. Centrbl., 1879, 722.

1879 : 2. J. Thomsen. (Thermo-chemical study of Thallium compounds.)
J. prakt. Chem. [2], **19**, 13 ; Jsb., 1878, 92.

1879 : 3. D. Playfair. (Occurrence of Thallium in pyrites.)
Chem. News, **39**, 245 ; Dingl. poly. J., **234**, 160 ; Jsb., 1879, 206.

1879 : 4. Gouy. (Spectrum of Thallium.)
Ann. chim phys. [5], **18**, 58.

1880 : 1. J. Thomsen. (Further thermo-chemical study of Thallium compounds.)
J. prakt. Chem., **21**, 38 ; **21**, 449 ; Chem. Centrbl., 1880, 390.

1880 : 2. L. Schucht. (Electrolytic determination of Thallium.)
Berg. u. Hüttenm. Zeit., **39**, 121 ; Chemikerzeit. 1880, 292 ; Zeitschr. anal. Chem., **22**, 241 ; Chem. Centrbl., 1880, 374 ; Jsb., 1880, 174.

1880 : 3. L. F. Nilson. (Thallium plato-iodo-nitrite.)
J. prakt. Chem. [2], **29**, 182 ; Chem. Centrbl., 1880, 261.

1880 : 4. Alfred Polis. (Thallium chrome alum.)
Ber., **13**, 367.

1880 : 5. Em. Schöne. (Action of oxygen on Thallium paper.)
Ber., **13**, 1508.

1881 : 1. F. Parmentier. (Thallium silico-molybdate.)
Compt. rend., **92**, 1234 ; J. Chem. Soc., **40**, 880.

1882 : 1. M. Schroeder. (Thallium paper as an indicator in titration with sodium sulphide.)
Berg. u. Hüttenm. Zeit., **40**, 4 ; Ber., **15**, 262 ; Chem. Tech. Jsb., 1882, 170.

1882 : 2. Ross. (Blowpipe reactions of Thallium.)
Berg. u. Hüttenm. Zeit., **40**, 459 ; Chem. Centrbl., 1882, 54.

1882 : 3. Rammelsberg. (Thallium phosphate.)
Sitzungsb. d. k. Preuss. Akad. d. Wissensch., 1882, 283 ; Ber., **15**, 2228 ; J. Chem. Soc., **44**, 424 ; Bull. Soc. chim., **39**, 64 ; Ann. der. Phys. Pogg. [2], **16**, 694 ; Chem. Centrbl., 1882, 450.

1882 : 4. O. PAVEL. (Thallium nitroso-sulphide.)
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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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INDEX TO THE LITERATURE OF THORIUM.

1817-1902.

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PREFACE.

This Index to the Literature of Thorium has been prepared after a very laborious and painstaking search through many scientific and technical journals.

Most of the references have been verified, and usually the original article heads the list, but in some few cases this was difficult to determine.

It is not offered as absolutely complete, and the compiler requests that any one using the index would send corrections and addenda to him.

Minerals now recognized as containing thorium have been mentioned only in such cases when the earth has been found. The patent literature relative to the use of thorium in the arts is not included.

C. H. J.

Columbia University,
New York, 1902.

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(1817-1902.)

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Smithsonian Miscellaneous Collections

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INDEX

TO THE

LITERATURE OF DIDYMIUM

1842–1893

BY

A. C. LANGMUIR, Ph. D.

CITY OF WASHINGTON
PUBLISHED BY THE SMITHSONIAN INSTITUTION
1894

LETTER OF TRANSMITTAL.

NEW YORK, JULY 24, 1894.

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the three following Indexes: —

AN INDEX TO THE LITERATURE OF CERIUM.[1]
AN INDEX TO THE LITERATURE OF LANTHANUM.[1]
Both by W. H. Magee, Ph. D.

AN INDEX TO THE LITERATURE OF DIDYMIUM.
By A. C. Langmuir, Ph. D.

The latter has already appeared in the School of Mines Quarterly, No. 1, Vol. XV.

H. CARRINGTON BOLTON,
Chairman.

To the SECRETARY of the SMITHSONIAN INSTITUTION.

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[1] These Indexes are printed as Smithsonian Publication No. 971.

INDEX TO THE LITERATURE OF DIDYMIUM — 1842–1893.

BY A. C. LANGMUIR, PH. D.

THE following paper is offered to chemists with the hope that it may be of some value to them in their researches on an element of great theoretical and scientific interest, particularly as an example of the wonderful results accomplished by the use of the spectroscope in modern chemistry. The voluminous literature of didymium affords a striking illustration of the pursuit of science for its own sake, and with no reward beyond the satisfaction of having advanced the cause of truth.

Original work, at the present time, must always be preceded by a long and painstaking search through the literature, which consumes no inconsiderable amount of time. Anything which can lighten the labors of the investigator in this direction is sure to be a welcome addition to the literature.

In 1882 Dr. H. Carrington Bolton originated the idea of indexing the literature of each of the chemical elements, and a Committee on Indexing Chemical Literature was appointed by the American Association for the Advancement of Science. The committee annually reports the progress made during the year, the reports being published in the *Chemical News* and in American journals.

The following elements have been indexed: —

Columbium. — Index to the literature of, 1801–1887, by Frank W. Traphagen, Smithsonian Miscellaneous Collections, No. 663, Washington, 1888.

Iridium. — Bibliography of the metal, 1803–1885, by N. W. Perry, in Mineral Resources of the United States, 1883–1884, p. 588; School of Mines Quarterly, 1885, p. 114; Chem. News, 1885, 51, p. 32.

Manganese. — Index to the literature of, 1596–1874, by H. C. Bolton, Annals of the Lyceum of Natural History, New York, Vol. II., Nov., 1875.

Titanium. — Index to the literature of, 1783–1876, by E. J. Hallock, Annals of the New York Academy of Sciences, Vol. I., Nos. 2 and 3, 1877.

Uranium. — Index to the literature of, by H. C. Bolton, 1789–1885, Smithsonian Reports for 1885, Washington, 1885, p. 919–946.

Vanadium. — Index to the literature of, 1801–1876, by G. Jewett Rockwell, Annals of the New York Academy of Sciences, Vol. I., No. 5, 1877.

The general plan of the following index corresponds with that of the others published. The indexes at the end of every volume of each journal were consulted, unless an index covering a series of years was available. The French journals proved to be very troublesome in this respect, as indexes at the end of the volume are often omitted, and the general indexes are seldom detailed enough to be of much value. This was especially true of the *Bull. Soc. Chim.* and the *Ann. Chim. Phys.*

The abbreviations used are those given by H. Carrington Bolton in his "Select Bibliography of Chemistry, 1492–1892," Smithsonian Miscellaneous Collections, No. 840, Washington, 1893.

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1843	Mosander . . .	Researches.	Phil. Mag. [3], 23, 241.
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			Ann.de Phys., Pogg., 60, 299–311.
			Ann. chim. phys. [3], 11, 464.
1843	L. Bonaparte .	Separation	Compt. rend., 16, 1008.
		from cerium.	J. prakt. Chem., 29, 268.
			Pharm. Centrbl., 1843, 719.
			Berzelius' Jsb., 1845, 115.
			Ann. der Phys., Pogg., 59, 623.
			Chem. Gaz., 1843, 405.
			Chemist, Watt, 4, 293.
			Am. J. Sci., 46, 206.
1845	Hermann	Existence of	J. prakt. Chem., 34, 182.
		Di doubted.	Berzelius' Jsb., 1845, 115.
1849	Marignac . . .	Separation	Arch. ph. nat., 11, 21.
		from cerium &	Ann. Chem., Liebig, 71, 306.
		lanthanum.	Ann. chim. phys. [3], 27, 209.
		At'mic weight.	J. prakt. Chem., 48, 423.
			Pharm. Centrbl., 1849, 837.
			Chemist, Watt, 1849, 20.
			Chem. Gaz., 1849, 329.
			Jsb., 1849, 263, 265.
1850	H. Watts	Sep'r'tion fr'm	J. Chem. Soc., 2, 140.
		cerium and	Pharm. Centrbl., 1849, 892.
		lanthanum.	
1853	Marignac . . .	Separation	Ann. chim. phys. [3], 38, 148–177.
		from	J. prakt. Chem., 59, 380–406.
		lanthanum.	Arch. ph. nat., 24, 278.
		At'mic weight.	Ann. Chem., Liebig, 88, 232.
		Compounds.	J. Chem. Soc., 6, 260–273.
			Chem. Gaz.. 1854, 141–148.
			Am. J. Sci. [2], 16, 413.
			Jsb., 1853, 346–343.
1856	Marignac . . .	Cryst'lline f'm	Compt. rend.. 42, 288.
		of sulphate.	Pharm. Centrbl., 1856, 179.
1857	Gladstone . . .	Optical test.	J. Chem. Soc., 10, 219.
			J. prakt. Chem., 73, 380.
			Am. J. Sci. [2], 25, 100.
			Jsb., 1857, 568.
1859	Marignac . . .	Compounds.	Ann. min. [5], 15, 272.
			Jsb., 1859, 138.

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1861	Nordenskiöld	Crystalline form of oxide.	Ann. der Phys., Pogg., 114, 618. Oefvers. K. Vet. Acad. Forhandl., 1860, 439. J. prakt. Chem, 85, 432. Pharm. Centrbl., 1862, 556.
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1862	Erdmann	Abs'pt'n sp'm.	J. prakt. Chem., 85, 394.
1862	O. N. Rood	Absorption spectrum.	Am. J. Sci. [2], 34, 129. Ann. der Phys., Pogg., 117, 350. Chem. News, 6, 140.
1864	Popp	Separation from cerium.	Ann. Chem., Liebig, 131, 359. Bull. soc. chim., 3, 385.
1864	Bunsen	Absorption spectrum.	Ann. Chem., Liebig, 131, 255. Arch. ph. nat., 21, 384. Phil. Mag. [4], 28, 246. Jsb., 1864, 108.
1864	Damour and Deville.	Estimation and separat'n.	Compt. rend., 59, 270. Instit., 1864, 269. Bull. soc. chim. [2], 2, 339. Chem. News, 10, 230. Jsb., 1864, 704.
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1864	Hermann	Sep'r'tion fr'm the thorium earths.	J. prakt. Chem., 93, 106.
1865	Williams	Occurrence in churchite.	Chem. News, 12, 183.
1865	Delafontaine	Absorption spectrum.	Arch. ph. nat., 21, 97. Ann. der Phys., Pogg., 124, 635. Ann. Chem., Liebig, 135, 194. J. prakt. Chem., 94, 303.

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1865	Winkler	Sep'r'tion fr'm lanthanum.	J. prakt. Chem., 95, 410. Ztschr. anal. Chem., 4, 417. Chem. Centrbl., 1865, 1007. Bull. soc. chim., 6, 204. Chem. News, 15, 178.
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1870	Erk	At'mic weight. Separation from lanthanum and yttrium.	Jenaische Ztschr. Med. Nat., 6, 299. Ztschr. Chem. [2], 7, 101–115. Ztschr. anal. Chem., 10, 476, 509. J. Chem. Soc., 1871, 494. Bull. soc. chim., 16, 84.
1870	W. Gibbs	Sulphate	Ber., 1870, 858.
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1872	Rammelsberg	Determinat'n in tantalites & columbites.	J. Chem. Soc., **25**, 194.
1873	Marignac	Crystallographic forms of salts.	Ann. chim. phys. [4], **30**, 56. Jsb. rein. Chem., 1873, 57. Bull. soc. chim., **20**, 84. J. Chem. Soc., **27**, 25.
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1873	Carlson	Plat'nocy'n'de	Ber., 1873, 1468.
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1875	Buhrig	Detection of traces by spectrum.	J. prakt. Chem. [2], 12, 209.
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1876	Pettersson	Molecular volume.	Ber., 1876, 1566.
1877	Delafontaine	Occurrence in N.C.s'm'rsk'te	Arch. ph. nat., 59, 176. Jsb., 1877, 251.
1877	Cleve	Compounds.	Bull. soc. chim. [2], 29, 492. Ber., 1878, 910. Jsb. rein. Chem., 1878, 80.
1878	Stolba	Sep'r'tion fr'm cerium and lanthanum.	Böhm. Ges. d. Wissensch., 1878. Jsb., 1878, 1059.
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1879	Cossa	Occurrence in scheelite, etc.	Compt. rend., 87, 377. Ber., 1879, 362. Chem. Centrbl., 1879, 128. Jsb. Min., 1879, 615. Ztschr. Kryst., 3, 447. Chem. News, 40, 90. Jsb., 1879, 1179.
1879	Cossa	Detection in minerals.	Ztschr. Kryst., 3, 325. Jsb. rein. Chem., 1879, 66.
1879	Soret	Absorption spectrum.	Compt. rend., 88, 422.
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1879	Sella	Tungstate.	R. Acad. Lincei, 3, 26. Ztschr. Kryst., 3, 631. Jsb. rein. Chem., 1879, 66. Chem. News, 40, 90.
1879	Kopp	At'mic weight. Isomorphism.	Ber., 1879, 909.
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1883	Cleve	At'mic weight.	Bull. soc. chim. [2], 39, 289. Ber., 1883, 1212. J. Chem. Soc., 44, 852. Chem News, 47, 203. Jsb., 1883, 37.
1883	Cleve	Separation from samarium.	Compt. rend., 97, 94. Ber., 1883, 2494. J. Chem. Soc., 43, 362. Chem. News, 48, 39, 74. Jsb., 1883, 361.
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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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INDEX TO THE LITERATURE
OF
ZIRCONIUM.

BY

A. C. LANGMUIR, PH.D.,

AND

CHARLES BASKERVILLE, PH.D.

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WASHINGTON, MAY 10th, 1899.

The Committee on Indexing Chemical Literature, appointed in 1882 by the American Association for the Advancement of Science, unanimously recommends for publication by the Smithsonian Institution the following:

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by A. C. Langmuir, Ph.D., and Charles Baskerville, Ph.D.

H. CARRINGTON BOLTON,
Chairman.

MR. S. P. LANGLEY,
Secretary of the Smithsonian Institution.

PREFACE.

An "Index to the Literature of Zirconium" was begun independently by the two authors. Learning of this, and in order to avoid further unnecessary duplication, it was decided to combine the references then on hand and to divide the remaining labor. The resulting product is thought to contain most of the important references to the element, and is offered to the Committee of the American Association for the Advancement of Science on Indexing Chemical Literature in hopes of its proving of value. The references are brought up to January 1st, 1899.

Besides our private libraries, we have sought references to the subject in the libraries of Columbia, Johns Hopkins, and the North Carolina Universities and the North Carolina Geological Survey. To the gentlemen in charge of these libraries we wish to extend our thanks for their courtesy and co-operation.

A. C. Langmuir,
C. Baskerville.

April, 1899.

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J. prakt. Chem. [2], **4**, 298 ; Compt. rend., **73**, 563 ; Instit., 1871, 49 ; Bull. Soc. chim. (Paris), **16**, 240 ; J. Chem. Soc. (Lond.), **24**, 1000 ; Gazz. chim. ital., **1**, 628 ; Jsb., 1871, 293.

1871 : 114. TROOST and HAUTEFEUILLE. (Spectrum.)
Compt. rend., **73**, 620 : Instit., 1871, 77 ; Arch. ph. nat., **42**, 178 ; Bull. Soc. chim. (Paris), **16**, 229 ; Ztschr. Chem., 1871, 465 : J. Chem. Soc. (Lond.), **24**, 1147 ; Jsb., 1871, 169.

1871 : 115. RAMMELSBERG. (Separation from niobic and tantalic acids.)
J. Chem. Soc. (Lond.), **25**, 195 ; Ber., **4**, 875.

1872 : 116. Rammelsberg. (Action of heat on amorphous oxide.)

Ber., **5**, 1006.

1872 : 117. Rammelsberg. (Sulphate.)

Ber., **5**, 1005.

1872 : 118. Troost and Hautefeuille. (Action of silicon chloride on oxide.)

Compt. rend., **75**, 1819 ; Ber., **6**, 34 ; Gazz. chim. ital., **2**, 27 ; Jsb., 1872, 226.

1872 : 119. Nordenskjöld. (Occurrence in nohlite.)

Bull. Soc. chim. (Paris), **18**, 178.

1873 : 120. Mallard. (Behavior of oxide with sodium carbonate.)

Compt. rend., **75**, 472 ; Gazz. chim. ital., **3**, 84.

1873 : 121. Hannay. (Zirconia.)

J. Chem. Soc. (Lond.), **26**, 703–10 ; Chem. News, **27**, 232 ; Ber., **6**, 571 ; Am. Chemist, **4**, 194 ; Jsb. rein. Chem., **1**, 73 ; Gazz. chim. ital., **3**, 468.

1873 : 122. Mixter and Dana. (Specific heat.)

Ann. Chem. (Liebig), **169**, 388 ; Chem. Centrbl., 1873, 721 ; Bull. Soc. chim. (Paris), **21**, 68 ; Jsb. rein. Chem., **1**, 73 ; J. Chem. Soc. (Lond.), **27**, 118 ; Am. J. Sci. [3], **7**, 506–7 ; Gazz. chim. ital., **3**, 577 ; **5**, 107 ; Jsb., 1873, 58.

1873 : 123. Paykull. (Compounds : Hydroxide, oxychloride, double chlorides, sulphate, arsenate, and ortho-phosphate.)

Oefvers. Sv. Vetensk. Akad. Förh., 1873, 22 ; Ber., 1873, 1467 ; Jsb. rein. Chem., **1**, 73 ; Bull. Soc. chim. (Paris), **20**, 65 ; Chem. News, **28**, 45 ; J. Chem. Soc. (Lond.), **26**, 1105 ; Chem. Centrbl., 1873, 594 ; Gazz. chim. ital., **3**, 484 ; Am. Chemist, **4**, 393 ; Jsb., 1873, 263.

1873 : 124. Jannettaz. (Propagation of heat by Zirconia.)

Ann. chim. phys. [4], **29**, 33.

1874 : 125. Troost and Hautefeuille. (Spectrum.)

Compt. rend., **73**, 620 ; Ztschr. anal. Chem., **13**, 313–4.

1875 : 126. Endemann. (Soluble basic salts.)

Am. Chemist, **5**, 326–7 ; Bull. Soc. chim. (Paris), **24**, 466 ; J. prakt. Chem. [2], **11**, 219 ; Jsb. rein. Chem., **3**, 84 ; J. Chem. Soc. (Lond.), **28**, 1162 ; Gazz. chim. ital., **6**, 428 ; Chem. Centrbl., 1875, 339 ; Jsb., 1875, 219.

1875 : 127. Nilson. (Selenites.)

"Researches on Salts of Selenious Acid," Upsala, 1875.

1876 : 128. Nilson. (Platinate.)

Ber., **9**, 1143 ; Bull. Soc. chim., **27**, 209 ; Jsb., 1876, 294.

1876 : 129. Hornberger. (Comparison with silicon. Preparation pure chloride. Alkaline tartrates. Cyanogen compounds.)

Am. Chem. (Liebig). **181**, 232 : Bull. Soc. chim. (Paris). **26**, 493 ; Jsb. rein. Chem., **4**, 90 : J. de Pharm. [4], **25**, 154 ; J. Chem. Soc. (Lond.). **30**, 275 ; Chem. News. **33**, 261 : Gazz. chim. ital., **7**, 166, 232 ; Chem. Centrbl., 1876, 435 ; Jsb., 1876, 240.

1877 : 130. Philipp. (Technology.)

Jsb., 1877, 1121.

1877 : 131. Draper. (Zirconia cylinders for oxyhydrogen light.)

Am. J. Sci. [3]. **14**, 208 ; Chem. Centrbl., 1877, 673.

1877 : 132. Vincent. (Behavior towards trimethylaniline.).

Bull. Soc. chim. (Paris), **27**, 194 ; Chem. Centrbl., 1878, 263.

1878 : 133. Philipp. (Zirconia light.)

Monit. sci. (Quesneville), **20**, 481.

1878 : 134. Mallet. (Occurrence in sipylite.)

Am. J. Sci. [3]. **14**, 397 ; Chem. Centrbl., 1878, 7.

1879 : 135. Friedel and Crafts. (Action of chloride on organic compounds.)

Bull. Soc. chim. (Paris). **31**, 531 ; Ber., **12**, 373.

1879 : 136. Paykull. (Compounds.)

Ber. **12**, 1719.

1880 : 137. Ängström. (Oxide, diamagnetic.)

Jsb., 1880, 338 ; Dammer II., 1. 619.

1880 : 138. Soret. (Spectrum.)

Arch. ph. nat. [3], **4**, 261 : Jsb., 1880. 214.

1880 : 139. Nilson and Pettersson. (Specific heat.)

Compt. rend., **91**, 232 : Ber., **13**, 1461 ; Jsb., 1880. 237.

1880 : 140. Vincent. (Behavior towards dimethylaniline.)

Bull. Soc. chim., Paris, **33**, 156–8 ; Ztschr. anal. Chem., **19**, 479 ; Chem. Centrbl., 1880, 279.

1881 : 141. Clarke. (Atomic weight.)

Phil. Mag. [5]. **12**, 101 ; Am. Chem. J., **3**, 263 : Jsb., 1881. 7.

1881 : 142. Crookes. (Phosphorescent spectrum.)

Bakerian Lecture. May 31, 1883. Lond. Roy. Soc. Proc., **32**, 206 ; Ann. chim. phys. [5]. **23**, 555 ; Compt. rend., **92**, 1281 : Chem. News, **43**, 237 ; Jsb., 1881, 131.

1882 : 143. Weller. (Action of hydrogen peroxide on.)

Ber., **14**, 2592 : Jsb., 1882. 1292.

1882 : 144. Classen. (Electrolytic separation.)

Ber., **14**, 2783 ; Zeit. anal. Chem., **22**, 421 ; Chem. Centrbl., 1882, 233.

1882 : 145. Levy and Bourgeois. (Microchemical reaction.)

Compt. rend., **94**, 812 ; Chem. News, **45**, 240 ; Jsb., 1882, 1527.

1882 : 146. Boisbaudran. (Separation from gallium.)

Compt. rend., **94**, 1154 ; Chem. News, **45**, 207 ; Jsb., 1882, 1296.

1883 : 147. Donath and Mayrhofer. (Affinity.)

Ber., **16**, 1588 ; Jsb., 1883, 26.

1884 : 148. Clarke. (Atomic weight.)

Chem. Ztg., **8**, 930.

1884 : 149. Stolba. (Opening up Zircons.)

Chem. News, **49**, 174 ; J. Chem. Soc., **46**, 821 ; Jsb., 1884, 1594.

1885 : 150. Groshaus. (Density.)

Rev. Trav. chim. pays bas., **4**, 236 ; Jsb., 1885, 53.

1885 : 151. Crookes. (Spectrum when samarium is present.)

Compt. rend., **100**, 1380 ; Lond. Roy. Soc. Proc., **38**, 414 ; Chem. News, **51**, 301 ; Jsb., 1885, 332.

1885 : 152. Demarçay. (Separation from titanium.)

Compt. rend., **100**, 740-742 ; Rep. anal. Chem., 1885, 186 ; Chem. Centrbl., **56**, 283 ; Jsb., 1885, 1929.

1885 : 153. Cléve. (Peroxide.)

Bull. Soc. chim. (Paris), **43**, 57 ; Ztschr. anal. Chem., **28**, 699 ; Jsb., 1885, 492.

1885 : 154. Linnemann. (Qualitative composition. Opening up Zircons.)

Monatsh. Chem., **6**, 335–47 ; Chem. Ztg., **9**, 1244 ; Ber., **18**, c, 459, 460 ; J. Chem. Soc., **48**, 1042 ; Chem. News, **52**, 233, 240 ; Chem. Centrbl., **56**, 666, 667.

1885 : 155. Linnemann. (Absorption spectra of Zircons.)

Monatsh. Chem., **6**, 531, 536 ; Ber., **18**, c, 605 ; J. Chem. Soc., **48**, 1173 ; Chem. News, **52**, 220 ; Chem. Centrbl., **56**, 907 ; Jsb., 1885, 2271.

1886 : 156. Bailey. (Separation and estimation by hydrogen peroxide.)

J. Chem. Soc., **49**, 149-152 ; Chem. News, **53**, 55, 260 ; Ann. Chem. (Liebig), **232**, 352 ; Ber., **19**, c, 319 ; Chem. Ztg., **10**, 1, 148, 677 ; Pharm. J. [3], **16**, 1022 ; Chem. Centrbl., **57**, 172, 451.

1886 : 157. BAILEY. (Separation and estimation by hydrogen peroxide.)

J. Chem. Soc. (Lond.), **49**, 481–6 ; Chem. News, **53**, 160 ; Am. J. Sci., **26**, 470 ; Ztschr. anal. Chem., **28**, 699 ; Ann. Chem. (Liebig), **232**, 352 ; Ber., **19**, c, 881 ; Chem. Centrbl., **57**, 682 ; Jsb., 1886, 1942.

1886 : 158. LINNEMANN. (Zirconia light.)

Monatsh. Chem., **6**, 899–908 ; J. Chem. Soc. (Lond.), 50, 417 ; Chem. Centrbl., **57**, 263, 264 ; Wagner's Jsb., **32**, 381–4 ; Jsb., 1885, 2167.

1886 : 159. HAUTEFEUILLE and MARGOTTET. (Phosphate.)

Compt. rend., **102**, 1017–1019 ; Ber., **19**, c, 387 ; J. Chem. Soc. (Lond.), **50**, 670 ; Chem. News, **53**, 252 ; Chem. Centrbl., **57**, 468 ; Jsb., 1886, 447.

1886 : 160. VAN DER PLAATS. (Atomic weight.)

Ann. chim. phys. [6], **7**, 501 ; Zeitschr. anal. Chem., **26**, 276.

1886 : 161. TROOST and OUVRARD. (Double potassium phosphate.)

Compt. rend., **102**, 1422–7 ; Ber., **19**, c, 659 ; J. Chem. Soc., **50**, 853 ; Chem. Centrbl., **57**, 594 ; Jsb., 1886, 453, 454.

1887 : 162. MEYER and WILKINS. (Action of carbon tetrachloride on oxide.)

Ber., **20**, 683 ; Jsb., 1887, 379.

1887 : 163. DITTE. (Behavior towards sulphuric acid. Selenate.)

Compt. rend., **104**, 172 ; Jsb., 1887 [1], 547, 549 ; Dammer. II, 1, 622.

1887 : 164. RAMMELSBERG. (Separation from thorium, cerium, etc.)

Sitzber. Akad. Wissin., Berlin, 1886, 441 ; Ber., **20**, c, 413.

1887 : 165. PICCINI. (Action of hydrogen peroxide.)

Gazz. chim. ital., **17**, 486 ; Jsb., 1887, 551.

1887 : 166. DEMARÇAY. (Action of carbon tetrachloride on Zirconia.)

Compt. rend., **104**, 113 ; Ber., **20**, c, 96 ; Chem. Centrbl., **58**, 214 ; Jsb., 1887, 380.

1887 : 167. WILLGERODT. (Action as a chloridizing agent.)

J. prakt. Chem. [2], **35**, 391 ; Ber., **20**, c, 312 ; Chem. Centrbl., **58**, 720 ; Jsb., 1887, 618.

1887 : 168. WEIBULL. (Crystalline forms of Zirconyl chloride and bromide ; also sulphate.)

Ber., **20**, a, 1394–6 ; J. Chem. Soc. (Lond.), **52**, 778 ; Chem. Centrbl., **58**, 778 ; Jsb., 1887, 553.

1887 : 169. Troost and Ouvrard. (Double sodium phosphate. Comparison with thorium.)

Compt. rend., **105**, 30–4; Ber., **20**, c, 534; J. Chem. Soc. (Lond.), **52**, 1017; Chem. News, **56**, 57; Chem. Centrbl., **58**, 1015; Jsb., 1887, 554–6.

1887 : 170. Hinsberg. (Attempt to prepare Zirconium ethyl. Iodide.)

Ann. Chem. (Liebig), **239**, 253–6; Ber., **20**, c, 413; J. Chem. Soc. (Lond.). **52**, 896; Chem. News, **56**, 219: Chem. Centrbl., **58**, 1016: Jsb., 1887, 553.

1887 : 171. Troost and Ouvrard. (Zircon not isomorphous with thorium silicate.)

Compt. rend., **105**, 255; Chem. Centrbl., **58**, 1098; Jsb., 1887, 556; Ber., **20**, c, 534.

1887 : 172. Welsbach. (Welsbach burners.)

Ber., **20**, c, 406; Chem. News, **55**, 192; Chem. Centrbl., 1887, 1125; Jsb., 1887. 2670; German Patent, 39, 162.

1888 : 173. Hautefeuille and Perrey. (Artificial preparation of Zircon.)

Compt. rend., **107**, 1000, 1001; Ber., **22**, c, 94: J. Chem. Soc. (Lond.), **56**, 355: Chem. News, **59**, 11; Monit. sci. (Quesneville), **33**, 199; Chem. Centrbl., 1889 [1], 127; Jsb., 1888, 638.

1888 : 174. Blömstrand. (Constitution of silicates containing Zirconium.)

Ztschr. Kryst.; **15**, 83, 84; Chem. Centrbl., 1889 [1], 821; Jsb., 1888, 637.

1888 : 175. Keeport. (Application in gold metallurgy.)

Ber., **21**, c. 458; Wagner's Jsb., **34**, 369; Jsb., 1888, 2650: German Patent, 43, 231.

1888 : 176. Carnelley and Walker. (Action of heat on hydrate.)

J. Chem. Soc. (Lond.), **53**, 68, 82; Ber., **21**, 131.

1888 : 177. Schmidt and Haensch. (Emissive power of Linnemann's light.)

Ann. der Phys. (Pogg.), Berbl., **12**, 244: Jsb., 1888, 2838.

1889 : 178. Riördan. (Preparation from eudialyte.)

Chem. Centrbl., 1889, 533.

1889 : 179. Welsbach. (Preparation of pure nitrate.)

Chem. Ztg., **13** [2], 1192; American Patent, 409. 653.

1889 : 180. Stolba. (Opening up Zircon.)

Listy chemické, **13**, 117. 118; Chem. Centrbl., 1889. 1, 297.

1889 : 181. Davis. (Separation from aluminium.)

Amer. Chem. J., **11**, 26–9 ; Ztschr. anal. Chem., **29**, 454, 455 ; Ber., **22**, c. 300 ; J. Chem. Soc. (Lond.), **56**, 551 ; Chem. News, **59**, 100, 101 ; Chem. Centrbl., 60. 1. 454 ; Jsb., 1889, 2388.

1889 : 182. Day. (Production in United States.)

Mineral Resources, U. S. 6th report ; J. Soc. Chem., Ind., **8**, 591.

1889 : 183. Bailey. (Atomic weight. Oxychloride. Peroxide.)

Lond. Roy. Soc. Proc., **46**, 74–87 ; Chem. News, **60**, 6–8, 17, 18, 32 ; J. Chem. Soc. (Lond.), **58**, 705 ; Ztschr. anal. Chem., **29**, 743–7 ; Nature, **36**, 568 ; Ber., **22**, c. 655, 666 ; Ztschr. physikal Chem., **4**, 494 ; Chem. Centrbl., 1889 [2], 311, 312 ; Jsb., 1889, 113–6 ; Brit. Assn. Trans., 1887, 636.

1890 : 184. Hautefeuille and Perrey. (Action of hydrochloric acid gas on oxide.)

Compt. rend., **110**, 1038 ; Ber., **23**, c, 428 ; J. Chem. Soc. (Lond.). **58** 1071.

1890 : 185. Warren. (Precipitation by magnesium.)

Chem. News, **61**, 183 ; Ber., **23**, c, 560 ; Jsb., 1890, 42.

1890 : 186. Hirschwald. (Solubility in microcosmic salt bead.)

J. prakt. Chem. [2], **41**, 360 ; Jsb., 1890, 2421.

1890 : 187. Winkler. (Reduction of oxide by magnesium.)

Ber., **23**, b, 2664–8 ; J. Chem. Soc. (Lond.), **58**, 1375 ; Chem. Centrbl., 1890 [2], 644, 645 ; Jsb., 1890, 432.

1890 : 188. Imray. (Preparation from ores.)

J. Soc. Chem. Ind., **9**, 941 ; English Patent, 16, 555.

1890 : 189. Kochs. (Zirconia light.)

Dingl. Polyt. J., **278**, 235–40 ; J. Soc. Chem. Ind., **10**, 37 ; Wagner's Jsb., **37**, 62 ; Eng. and Mining J., **51**, 466 ; Jsb., 1890, 2850.

1891 : 190. Venable. (Preparation of pure chloride.)

J. anal. Chem., **5**, 551 ; J. El. Mitchell Sc. Soc., **8**, 20 ; Chem. Ztg., **15**, 328 ; J. Chem. Soc. (Lond.), **62**, 412 ; Chem. News, **64**, 315, 316 ; Chem. Centrbl., 1891 [1], 149 ; Jsb., 1891, 575.

1891 : 191. Drossbach. (Zirconia pencils.)

Chem. Ztg., **15** [1], 328 ; Chem. Centrbl., 1891 [1], 772, 773.

1891 : 192. Behrens. (Microchemical reaction.)

Ztschr. anal. Chem., **30**, 156 ; Chem. News, **64**, 124.

1891 : 193. Morehead. (Analysis of Zircon.)

J. El. Mitchell Sc. Soc., **8**, 24.

1891 : 194. WINKLER. (Action of magnesium on oxide. Hydride.)
Ber., **24**, a, 888 ; J. Chem. Soc. (Lond.), **60**, 802 ; Bull. Soc. chim. (Paris), [3], **6**, 173 ; Chem. Centrbl., 1891 [1], 912 ; Jsb., 1891, 499.

1891 : 195. VENABLE. (Occurrence.)
J. El. Mitchell Sc. Soc., **8**, 74.

1891 : 196. OUVRARD. (Alkaline Zirconates.)
Compt. rend., **112**, 1444–6 ; Ber., **24**, c, 694 ; J. Chem. Soc. (Lond.), **60**, 1431 ; Monit. sci. (Quesneville), **37**, 868 ; Chem. News, **64**, 26 ; Chem. Centrbl., **62**, 2248 ; Jsb., 1891, 576.

1891 : 197. OUVRARD. (Alkaline earth Zirconates.)
Compt. rend., **113**, 80–2 ; Monit. sci. (Quesneville), **37**, 976 ; J. Chem. Soc. (Lond.), **60**, 1431 ; Chem. News, **64**, 61 ; Chem. Centrbl., 1891 [2], 415 ; R. Meyer's Jahrb., **1**, 89.

1891 : 198. WALLER. (Zirconium light.)
Eng. and Mining J., **51**, 520.

1892 : 199. CHRUSTSCHOFF. (Artificial production Zircon.)
Jahrb. Mineralogie, 1892 [2], 232–6 ; Chem. Centrbl., 1893 [1], 123 ; [2], 880, 881.

1893 : 200. BASKERVILLE. (Comparison of methods of analysis.)
Doctorate Dissertation, J. El. Mitchell Sc. Soc., **10**, 45–68.

1893 : 201. MCKEAN. (Color of light emitted.)
Zeit. Ver. Deutschr. Ing., 1893, 310 ; R. Meyer's Jahrb., **3**, 335.

1893 : 202. VENABLE. (Examination of chlorides.)
J. El. Mitchell Sc. Soc., **10**, 79–87.

1893 : 203. MOISSAN. (Volatilization in electric furnace.)
Compt. rend., **116**, 1222–4 ; J. Chem. Soc. (Lond.), **64** [2], 532 ; Chem. News, **68**, 16 ; Ber., **26**, d, 482 ; Ztschr. anorg. Chem., **4**, 473 ; Bull. Soc. chim. (Paris), [3], **11**, 863–4 ; Chem. Centrbl., 1893 [2], 190 ; R. Meyer's Jahrb., **3**, 71.

1893 : 204. TROOST. (Preparation of metal in electric furnace.)
Compt. rend., **116**, 1227–30 ; J. Chem. Soc. (Lond.), **64** [2], 473 ; Bull. Soc. chim. (Paris), [3], **9**, 792 ; Ber., **26**, d, 483 ; Ztschr. anorg. Chem., **4**, 474 ; R. Meyer's Jahrb., **3**, 75 ; Chem. Centrbl., 1893 [2], 191.

1893 : 205. TROOST. (Preparation of oxide in electric furnace.)
Compt. rend., **116**, 1428, 1429 ; J. Chem. Soc. (Lond.), **64** [2], 532 ; Chem. News, **68**, 28 ; Ztschr. anorg. Chem., **5**, 241 ; Bull. Soc. chim. (Paris), [3], **9**, 794 ; Ber., **26**, d, 669 ; Chem. Centrbl., 1893 [2], 356.

1893 : 206. Péchard. (Molybdate.)

Compt. rend., **117**, 788–90 ; J. Chem. Soc. (Lond.), **66** [2], 96 : Bull. Soc. chim. (Paris), [3], **11**, 184 ; Ztschr. anorg. Chem., **6**, 200 ; Ber., **27**, d, 2 ; Chem. Centrbl., 1893 [1], 140.

1894 : 207. Read. (Behavior of oxide at high temperatures.)

J. Chem. Soc. (Lond.), **65**, 314.

1894 : 208. Witt. (Emissive power in Welsbach burner.)

Wagner's Jsb., **40**, 540.

1894 : 209. Baskerville. (Separation by sulphur dioxide.)

J. Amer. Chem. Soc., **16**, 475, 476 ; J. Chem. Soc. (Lond.), **66** [2], 401 ; Chem. News, **70**, 57 ; Ztschr. anorg. Chem., **7**, 434 ; Bull. Soc. chim. (Paris), [3], **12**, 1283 ; Chem. Centrbl., 1894 [2], 299 ; R. Meyer's Jahrb., **4**, 98 ; J. El. Mitchell Sc. Soc., **11**, 85–7.

1894 : 210. Venable. (Chlorides. Separation from silicon and iron.)

J. Amer. Chem. Soc., **16**, 469–75 ; Chem. News, **70**, 217–9 ; J. Chem. Soc. (Lond.), **66** [2], 385 ; Chem. Centrbl., 1894 [2], 299 ; R. Meyer's Jahrb., **4**, 98.

1895 : 211. Smith and Harris. (Action of phosphorus pentachloride on oxide.)

J. Amer. Chem. Soc., **17**, 654–6 ; J. Chem. Soc. (Lond.), **70** [2], 179 ; Bull. Soc. chim. (Paris), [3], **16**, 225 ; Chem. Centrbl., 1895 [2], 590.

1895 : 212. Venable and Baskerville. (Sulphites.)

J. Amer. Chem. Soc., **17**, 448–53 ; J. Chem. Soc. (Lond.), **70** [2], 527 ; J. El. Mitchell Sc. Soc., **12**, 16–22 ; Bull. Soc. chim. (Paris), [3], **14**, 107 ; Chem. Centrbl., 1895 [2], 15.

1895 : 213. Venable. (Chlorides.)

J. Amer. Chem. Soc., **17**, 842, 843 ; J. El. Mitchell Sc. Soc., **12**, 22, 23 ; J. Chem. Soc. (Lond.), **70** [2], 478 ; Chem. News, **73**, 25 ; Chem. Centrbl., 1896 [1], 15.

1896 : 214. Larsson. (Niobate.)

Ztschr. anorg. Chem., **12**, 203 ; Ber., **29**, d. 635 ; Chem. Centrbl., 1896 [2], 235 ; J. Chem. Soc., **70** [2], 564.

1896 : 215. Barnes. (Use as a mordant.)

J. Soc. Chem. Ind., **15**, 420 ; Ber., **29**, d, 1097.

1896 : 216. Piccini. (Action of hydrogen peroxide on fluoride.)

Ztschr. anorg. Chem., **10**, 438 ; Ber., **29**, d, 129.

1896 : 217. Landolt. (Zirconia light.)

Ztschr. anal. Chem., **35**, 714.

1896 : 218. Phipson. (Abundant source in Norwegian granite.)

Chem. News, **73**, 145 ; Bull. Soc. chim. (Paris), [3], **16**, 1756 ; J. Chem. Soc., **70** [2], 422 ; Chem. Centrbl., 1896 [1], 1052.

1896 : 219. Moissan and Lengfeld. (Carbide.)

Compt. rend., **122**, 651–4 ; Bull. Soc. chim. (Paris), [3], **15**, 1275–8 ; Monit. sci. (Quesneville), **46**, 393 ; Ber., **29**, d, 343 ; Chem. Centrbl., 1896 [1], 1887 ; R. Meyer's Jahrb., **6**, 78.

1896 : 220. Hallopeau. (Tungstates.)

Bull. Soc. chim. (Paris), [3], **15**, 917–23 ; Compt. rend., **122**, 1419–22 ; Chem. News, **74**, 12 ; Monit. sci. (Quesneville), **47**, 636 ; J. Chem. Soc. (Lond.), **70** [2], 607 ; Ber., **29**, d, 582 ; Chem. Centrbl., 2896 [2], 775.

1896 : 221. Venable and T. Clarke. (Various Zirconates of Alkalies and alkaline earths.)

J. Amer. Chem. Soc., **18**, 434–44 ; J. El. Mitchell Sc. Soc., **13**, 1–13 ; Chem. News, **74**, 42–4, 54, 55 ; J. Chem. Soc. (Lond.), **70** [2], 653 ; Ber., **29**, d, 1094 ; Chem. Centrbl., 1896 [2], 11, 12.

1896 : 222. St. John. (Illuminating power of oxide.)

Ann. der Phys. (Wied.), **56**, 433 ; Wagner's Jsb., **42**, 72.

1896 : 223. Traube. (Opening up Zircons.)

Jahrb. Mineral., **10**, 470–6 ; Chem. Centrbl., 1896 [2], 130.

1896 : 224. Müller–Jacobs. (Tannate.)

American Patent, 558, 197 ; Ber., **29**, d, 448.

1896 : 225. Moissan. (Carbide.)

Compt. rend., **122**, 1462 ; Ber., **29**, d, 614 ; Chem. News, **73**, 175 ; J. Chem. Soc. (Lond.), **70** [2], 428 ; R. Meyer's Jahrb., **6**, 78.

1896 : 226. Wells and Foote. (Double fluorides.)

Ztschr. anorg. Chem., **10**, 434–7 ; Ber., **29**, d, 128 ; J. Chem. Soc. (Lond.), **70** [2], 179 ; Chem. Centrbl., 1896 [1], 239 ; R. Meyer's Jahrb., **7**, 86.

1896 : 227. Dennis and Spencer. (Tetraiodide.)

J. Amer. Chem. Soc., **18**, 673–9 ; Chem. News, **74**, 102–4 ; Ber., **29**, d, 1097 ; Chem. Centrbl., 1896 [2], 651, 652 ; R. Meyer's Jahrb., **6**, 82.

1896 : 228. Fresenius and Hintz. (Determination in thorium nitrate.)

Ztschr. anal. Chem., **35**, 535.

1896 : 229. Glaser. (Determination in monazite.)

J. Amer. Chem. Soc., **18**, 782–93 ; Chem. News, **75**, 145–7, 157 ; Chem. Ztg., **20**, 612–14 ; Chem. Centrbl., 1896 [2], 803.

1897 : 230. VENABLE and BASKERVILLE. (Oxalates.)

J. Amer. Chem. Soc., **19**, 12–18; J. El. Mitchell Sc. Soc., **14**, 4–12; Chem. News, **75**, 113–15; Chem. Centrbl., 1897 [1], 905: R. Meyer's Jahrb., **7**, 86; J. Chem. Soc. (Lond.), **78**, a [II], 295.

1897 : 231. DELAFONTAINE. (Separation from thorium.)

Chem. News, **75**, 230; Chem. Centrbl., 1897 [2], 70.

1897 : 232. WELLS and FOOTE. (Double fluorides.)

Am. J. Sci. [4], **3**, 466–71: Chem. News, **76**, 44–6; Chem. Centrbl., 1897 [2], 94, 95.

1898 : 233. TRUCHOT. (Occurrence.)

Revue générale des Sciences: Chem. News, **77**, 146.

1898 : 234. VENABLE. (Atomic weight.)

J. Amer. Chem. Soc., **20**, 118–28: Chem. News, **77**, 221–3; J. El. Mitchell Sc. Soc., **14**, 27–46: Chem. Centrbl., 1898 [1], 708, 709: J. Chem. Soc. (Lond.), **78**, a [II], 438.

1898 : 235. VENABLE and BELDEN. (Properties of dioxide.)

J. Amer. Chem. Soc., **20**, 273–6; Chem. Centrbl., 1898 [1], 1095; J. Chem. Soc. (Lond.), **78**, a [II], 597.

1898 : 236. VENABLE and BASKERVILLE. (Oxyhalides.)

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INDEXES

TO THE

LITERATURES OF CERIUM AND LANTHANUM

BY

W. H. MAGEE, Ph. D.

CITY OF WASHINGTON
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1895

LETTER OF TRANSMITTAL.

NEW YORK, JULY 24, 1894.

The Committee of the American Association for the Advancement of Science having charge of Indexing Chemical Literature has voted to recommend to the Smithsonian Institution for publication the three following Indexes: —

AN INDEX TO THE LITERATURE OF CERIUM.
AN INDEX TO THE LITERATURE OF LANTHANUM.
Both by W. H. Magee, Ph. D.

AN INDEX TO THE LITERATURE OF DIDYMIUM.[1]
By A. C. Langmuir, Ph. D.

The latter has already appeared in the School of Mines Quarterly, No. 1, Vol. XV.

H. CARRINGTON BOLTON,
Chairman.

To the SECRETARY of the SMITHSONIAN INSTITUTION.

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[1] This Index is printed as Smithsonian Publication No. 972.

INDEXES TO THE LITERATURES OF CERIUM AND LANTHANUM.

BY W. H. MAGEE, PH. D.

INTRODUCTION.

THE following indexes to the literatures of cerium and lanthanum were prepared during the course of some work on the former element. They are not offered as being absolutely correct, but all the more important articles bearing upon the elements are certainly indexed, and usually the original article heads the list. In some few cases, however, it was difficult to determine the original. Whenever the journal was to be found on the library shelves the references were verified. No single library, however, contains all the journals to which references will be found.

That the indexing of chemical literature is of great and growing importance is evident; that the work should be as nearly perfect as possible is equally true. Yet few except those who have attempted the task realize the difficulty and labor involved. I would ask, therefore, as regards these indexes, that any one using them, and all chemists interested in the study of cerium and lanthanum, should send corrections and addenda to W. H. Magee, care of Professor L. M. Dennis, Cornell University, Ithaca, N. Y., so that after a few years perfectly correct indexes may be prepared.

The Indexes are arranged on the same plan as that of the Index to Uranium, published by Dr. H. Carrington Bolton in 1870, and followed by several other chemists. The abbreviations used are in the main those of the standard list printed in Bolton's Bibliography of Chemistry.

CORNELL UNIVERSITY,
ITHACA, N. Y., July 21, 1894.

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SMITHSONIAN MISCELLANEOUS COLLECTIONS.

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A BIBLIOGRAPHY
OF THE
ANALYTICAL CHEMISTRY
OF
MANGANESE.

1785–1900.

BY

HENRY P. TALBOT AND JOHN W. BROWN.

CITY OF WASHINGTON:
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LETTER OF TRANSMITTAL.

WASHINGTON, May 11th, 1901.

The Committee on Indexing Chemical Literature, appointed in 1882 by the American Association for the Advancement of Science, has voted to recommend to the Smithsonian Institution for publication the following:

"A Bibliography of the Analytical Chemistry of Manganese, 1785–1900," by Henry P. Talbot and John W. Brown.

This forms one of the following series:

Index to the Literature of Uranium, 1785–1885, by Henry Carrington Bolton, 1885.
Index to the Literature of Columbium, 1801–1887, by Frank W. Traphagen, 1888.
Index to the Literature of the Spectroscope, by Alfred Tuckerman, 1888.
Index to the Literature of Thermodynamics, by Alfred Tuckerman, 1890.
A Bibliography of the Chemical Influence of Light, by Alfred Tuckerman, 1891.
A Bibliography of Aceto-Acetic Ester, by Paul H. Seymour, 1894.
Index to the Literature of Didymium, 1842–1893, by A. C. Langmuir, 1895.
Indexes to the Literature of Cerium and Lanthanum, by W. H. Magee, 1895.
A Bibliography of the Metals of the Platinum Group, by Jas. Lewis Howe, 1897.
Review and Bibliography of the Metallic Carbides, by J. A. Mathews, 1898.
Index to the Literature of Thallium, 1861–1897, by Miss Martha Doan, 1898.
Index to the Literature of Zirconium, by A. C. Langmuir and Charles Baskerville, 1899.

HENRY CARRINGTON BOLTON,
Chairman.

MR. S. P. LANGLEY,
Secretary Smithsonian Institution.

PREFACE.

In 1875 Dr. H. Carrington Bolton published an "Index to the Literature of Manganese, 1596–1874," comprising the references to the entire available journal literature relating to manganese and its compounds which had appeared before the latter date. The general plan of his index did not, however, provide for the separate classification of the articles containing analytical data, and as the journal literature since 1874 has increased so enormously in volume as to render the search for such data very laborious, it was deemed worth while to compile a separate bibliography bearing upon the qualitative detection and quantitative separation and determination of manganese, for the use of analytical chemists. For this purpose Dr. Bolton's work has been reviewed almost from its beginning, and while we are in part indebted to his "Index" for the references from 1785 to about 1830 (having received his permission to make use of them), yet a number of these early journals were independently examined by us as indicated in our list. From 1830 the compilation is practically independent, although we desire to express our obligation to the Bolton "Index" for the opportunity afforded for the verification of a portion of our work. All the originals of the references have been examined except those marked with an asterisk.

The compilation of material for this Bibliography was practically completed when the "Bibliography of Steel-Works Analysis," published by Brearley in the *Chemical News*, 1899, came to our attention. We are indebted to this Bibliography for an opportunity to verify a portion of our later references and for some four or five references which we had omitted.

The abbreviations used in this Bibliography are those recommended by the Committee on Indexing Chemical Literature of the American Association for the Advancement of Science. The original reference is placed first, and, in general, articles corresponding to references which follow those to the *Chemisches Centralblatt* or the *Jahresbericht der Chemie* are decidedly briefer than the original papers. It has not been practicable, however, to rigidly maintain this distinction.

The Subject Index has been based upon such an examination of the original articles as was possible with a reasonable expenditure of time, and is based therefore upon the salient points rather than upon minute details, although an attempt has been made to carry the subdivision of subjects as far as possible. Under the heading "Applications of Quantitative Methods" (page 111 *et seq.*),only those references are, in general, included in which the title of the article specifies the material analyzed. This is particularly true of irons, steels, ferromanganese, and spiegeleisen.

We desire to express our obligation to Dr. H. C. Bolton for the permission to make use of his "Index," as well as for assistance in the examination of a file of journals, and to Mr. A. C. Davis for his valuable assistance in the examination of proof-sheets.

This compilation was made possible by a ready access to the valuable libraries of the Massachusetts Institute of Technology, notably the William Ripley Nichols Chemical Library, but we also wish to express our appreciation of the courtesies extended to us by the Boston Public Library, the Library of the American Academy of Arts and Sciences, the Boston Society of Natural History, the Surgeon-General's Office at Washington, the Library of Congress, the libraries of Yale, Columbia, Lehigh, and Harvard Universities, the Massachusetts College of Pharmacy, and the John Crerar and Astor Libraries. Professor James Lewis Howe's excellent "Bibliography of the Platinum Metals" has served as a model for the arrangement of our data.

HENRY P. TALBOT.
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MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
BOSTON

JANUARY, 1902.

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A BIBLIOGRAPHY OF THE ANALYTICAL CHEMISTRY OF MANGANESE.

1785-1900.

BY HENRY P. TALBOT AND JOHN W. BROWN.

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1833: 2. PLANIAWA. Trennung des Manganoxyds und Eisenoxyds.

* Baumgartner's N. Ztschr., 2, 241; Pharm. Centrbl., 1833, 699.

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Ann. chim. phys. (2), 60, 252; Pol. Centrbl., 1836, 286; Ann. Chem. (Liebig), 18, 47; Arch. Pharm., 58, 128.

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Ann. chim. phys. (2), 58, 199; Pharm. Centrbl., 1835, 437.

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Ann. der Phys. (Pogg.), 36, 565; Pharm. Centrbl., 1836, 175; Arch. Pharm., 58, 199.

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Comments on current methods for the valuation of manganese ores.

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Separation from zinc by ignition of the nitrates and treatment of the oxides with acetic acid.

1837: 4. Scheerer, T. Ueber eine Methode das Kobaltoxyd, sowie das Nickeloxyd und Manganoxyd vom Eisenoxyd, von der Arsenik- und Arsenigen-säure zu trennen. (*Title from Ann. der Phys.* [*Pogg.*].)

Nyt. Mag. Naturvidenskaberne, Physiographiske Forening Christiania, 1840, 46; Ann. der Phys. (Pogg.), 42, 104; Pharm. Centrbl., 1838, 7; J. prakt. Chem., 12, 354; Ann. des Mines, 13, 454; Dingl. pol. J., 68, 463; Arch. Pharm., 66, 202.
Separation from iron, arsenic and arsenious acids, by precipitation as basic sulphate or chloride.

1838: 1. Gieseler. Prüfung eines im Handel vorkommenden gepulverten Braunsteins auf seinen Gehalt an Manganhyperoxyd und an fremden Bestandtheilen.

Arch. Pharm., 65, 209.
Comments on Duflos' (1832: 3), Thomson's (1836: 2), and other methods for the determination of peroxide.

1838: 2. WACKENRODER, H. Neue Methode zur Scheidung des Mangans vom Eisen, Nickel, Kobalt und Zink.

Arch. Pharm., **66**, 113; Pharm. Centrbl., **1838**, 673 and 674; **1839**, 193; Berzelius' Jsb. (1840), **19**, 279; Jsb. chem., **1847**, 975.

Separation by means of sulphuretted hydrogen in acetic acid solution, and also by precipitation as sulphides and solution in dilute hydrochloric acid.

1839: 1. FIKENTSCHER, F. C. Prüfung der Braunsteinerze auf Sauerstoffgehalt.

J. prakt. Chem., **17**, 173; Dingl. pol. J., **73**, 204.

Determination of peroxide through loss of weight of strip of copper inserted in the hydrochloric acid during solution of the ore.

1839: 2. FUCHS, J. N. Eisenerzprobe (und Braunsteinprobe) auf nassem Wege.

J. prakt. Chem., **17**, 160; Pol. Centrbl., **1839**, 665.

See Fikentscher, 1839: 1.

1839: 3. W. Trennung von Kobalt und Mangan.

Ann. Chem. (Liebig), **29**, 217; Pharm. Centrbl., **1839**, 384; Ann. des Mines (3), **15**, 431; Arch. Pharm., **74**, 57.

Separation by means of silver nitrate and ammonia.

1841: 1. BERZELIUS. (Title unknown.)

Berzelius' Jsb., **20**, 189.

Treatment with hydrofluoric acid to determine the state of oxidation of manganese in its minerals.

1841: 2. HENRY. (Title unknown.)

* Acad. de Med., **1839**; Pharm. Centrbl., **1841**, 923.

Determination in mineral waters.

1841: 3. LIEBIG, J. Ueber Darstellung und Anwendung des Cyankaliums.

Ann. Chem. (Liebig), **41**, 293.

Separation from cobalt by means of cyanide.

1841: 4. ULLGREN. (Title unknown.)

Berzelius' Jsb., **21**, 147; Chem. Gaz., **1**, 13; Pharm. Centrbl., **1842**, 254; Ann. Chem. (Liebig), **40**, 266; Ann. des Mines (4), **2**, 206.

Separation from nickel and cobalt by precipitation with potassium hydroxide and hypochlorite, solution of the precipitate in hydrofluoric acid, and boiling with ammonia in excess.

1842: 1. LEA, H. C. Remarks upon the Examination of the Peroxide of Manganese.

Am. J. Sci. (1), **42**, 81.

Tests to distinguish manganous from manganic salts.

1842: 2. LEVOL, A. Nouveau moyen d'assai du manganèse.

J. de pharm. (3), **1**, a, 210; Chemist, **3**, 149; Pol. Centrbl., **1842**, 874; Dingl. pol. J., **85**, 299; Ann. des Mines (4), **2**, 205; J. prakt. Chem., **26**, 151; Chem. Gaz., **1**, 329; Ann. Chem. (Liebig), **44**, 355; Arch. Pharm., **81**, 322.

Determination of peroxide by solution of the ore in hydrochloric acid and a ferrous salt, and titration for the excess of the latter with potassium chlorate, using indigo test paper.

1842: 3. OTTO, J. F. Unterscheidung des Zinks von Mangan in Auflösungen welche Ammoniaksalze enthalten.

Ann. Chem. (Liebig), **42**, 347; Pharm. Centrbl., **1842**, 684; Chem. Gaz., **1**, 180; Am. J. Sci. (1), **47**, 194; Ann. des Mines (4), **3**, 569; Berzelius' Jsb., **23**, 242.

Separation by precipitation as sulphide and solution in acetic acid.

1842: 4. OTTO, J. F. Neue Methoden den Chlorkalk und den Braunstein zu prüfen.

Dingl. pol. J., **85**, 296; Pol. Centrbl., **1842**, 876; Chemist, **3**, 346; J. de pharm., **1842**, Mar.

Determination of peroxide by solution in hydrochloric acid and addition of ferrous sulphate, using potassium ferri-cyanide as an indicator.

1843: 1. BAUMANN, H. Prüfung des Braunsteins auf seinen Gehalt an Superoxyd.

Arch. Pharm., **84**, 171; Chem. Gaz., **1**, 499.

Solution of ore in hydrochloric acid and passage of chlorine into a solution of silver nitrate. (It is not evident how this procedure could possibly yield results of any value whatever.)

1843: 2. EBELMEN. Note sur le dosage du manganèse.

Ann. chim. phys. (3), **8**, 508; Ann. des Mines (4), **4**, 409; Pharm. Centrbl., **1844**, 400; Chem. Gaz.. **1843**, 685; Ann. Chem. (Liebig), **48**, 369; Arch. Pharm., **90**, 178.

Determination as protoxide by reduction of the higher oxides by ignition in a current of hydrogen.

1843: 3. FRESENIUS, F., and WILL, H. Neue Verfahrungsweisen zur Bestimmung des Werthes der Pottasche und Soda, der Säuren und des Braunsteins.

Ann. Chem. (Liebig), **47**, 87; **49**, 137; Dingl. pol. J., **90**, 219; Pol. Centrbl., **1843**, b, 395; Chem. Gaz., **1844**, 52; Pharm. Centrbl., **1843**, 804; Berzelius' Jsb. (1845), **24**, 261; Buchner's Rep., **83**, 240.

Determination of peroxide by solution with oxalates and absorption of the carbon dioxide.

1844: 1. ETTLING. Chemische Untersuchung des in der Nähe von Giessen vorkommenden Braunsteins.
Ann. Chem. (Liebig), **43**, 185; Berzelius' Jsb., **23**, 243.
Determination of peroxide by the procedure of Gay-Lussac (1835: 1).

1845: 1. CLOEZ. Séparation de l'oxyde de cobalt de l'oxyde de manganèse.
J. de pharm. (3), **7**, 157; Pharm. Centrbl., **1845**, 543; Berzelius' Jsb. (1847), **26**, 277; Chem. Gaz., **3**, 102.
Separation by means of potassium polysulphide.

1845: 2. CRUM, W. Empfindliches Prüfungsmittel auf Mangan.
Ann. Chem. (Liebig), **55**, 219; Pharm. Centrbl., **1845**, 894; Chem. Gaz., **3**, 502; Am. J. Sci. (2), **1**, 262; Ann. des Mines (4), **11**, 496; Ann. der Phys. (Pogg.), **105**, 294; J. de pharm. (3), **9**, 221; Berzelius' Jsb. (1847), **26**, 276.
Oxidation to permanganic acid by means of lead peroxide in nitric acid solution.

1846: 1. BARRESWIL. Sur un nouveau mode de séparation du cobalt d'avec le manganèse.
Ann. chim. phys. (3), **17**, 53; C. R., **22**, 421; Pharm. Centrbl., **1846**, 415; Jsb. Chem., **1847**, 974; Berzelius' Jsb., **27**, 214; Pol. Centrbl., **1847**, 642; **1848**, 1295; Am. J. Sci. (2), **2**, 260; Chem. Gaz., **1846**, 159; J. de pharm. (3), **9**, 189; Ann. des Mines (4), **11**, 499; Dingl. pol. J., **100**, 157; J. prakt. Chem., **38**, 171.
Separation by means of hydrogen sulphide in the presence of barium carbonate.

1846: 2. PHILLIPS, R. A New Test for Manganese.
Chemist, **7**, 152; Am. J. Sci. (2), **2**, 259.
Detection by means of the amethyst color given to solutions in which a piece of phosphorus is partly immersed, the whole being allowed to stand for some time in the dark.

1846: 3. ROWNEY, T. Analysis of the Bohemian Glass as found in the Combustion Tubes employed in Organic Analysis.
Proc. Chem. Soc. (Lond.), **3**, 300.
Determination in glass.

1846: 4. VÖLKER, A. Ueber die rothe Färbung der Manganoxydulsalze.
Ann. Chem. (Liebig), **59**, 27; Pharm. Centrbl., **1846**, 923; Chem. Gaz., **4**, 397.
Separation from cobalt by volatility of the manganous chloride in hydrogen.

1847: 1. BOBIERRE, A. (Title unknown.)
* Monit. Ind., **1847**, No. 1190; Dingl. pol. J., **107**, 448.
Modification of the Gay-Lussac apparatus for the determination of peroxide.

1847: 2. LEVOL, A. Additions concernant une méthode d'assai de manganèse publiée dans ce recueil en Mars 1842.

J. de pharm. (3), **10**, 26; Berzelius' Jsb. (1848), **27**, 213; J. prakt. Chem., **38**, 341.

Determination of the total amount of hydrochloric acid consumed by an ore, as well as the amount oxidized to chlorine. See 1842: 2.

1847: 3. ROSE, H. Ueber die Trennung des Nickels von Kobalt und die beider von anderen Metallen.

Ann. Chem. (Liebig), **64**, 417; Jsb. Chem., **1847**, 974; Ann. der Phys. (Pogg.), **71**, 555.

Separation by means of sulphides and treatment with dilute hydrochloric acid. Comments on Barreswil (1846: 1) and Wackenroder (1838: 2) methods.

1847: 4. STRECKER. Ueber Barreswil's Trennungsmethode des Kobalts von Mangan.

Ann. Chem. (Liebig), **61**, 219; Pharm. Centrbl., **1847**, 367; Jsb. Chem., **1847**, 974; Berzelius' Jsb. (1849), **28**, 179; Pol. Centrbl., **1848**, 1296; Chem. Gaz., **1847**, 205; Am. J. Sci. (2), **4**, 271.

Barreswil method regarded as inefficient. See 1846: 1.

1847: 5. SCHOENBEIN, C. F. Das Ozon als Reagens für Mangan.

Ann. der Phys. (Pogg.), **72**, 466; Jsb. Chem., **1847**, 952, Berzelius' Jsb. (1849), **28**, 180.

Detection through the browning of solutions by ozone.

1847: 6. DE VRY. Bestimmung des Braunsteingehalts.

Ann. Chem. (Liebig), **61**, 249; Pharm. Centrbl., **1847**, 479.

Recommendation of Fresenius-Will method. (1843: 3.)

1849: 1. EBELMEN. Sur un nouveau mode d'emploi de l'hydrogen sulfuré dans l'analyse chimique.

Ann. chim. phys. (3), **25**, 92; Chem. Centrbl., **1849**, 169; Jsb. Chem., **1849**, 592; Berzelius' Jsb. (1851), **30**, 161; J. de pharm. (3), **15**, 266; J. prakt. Chem., **46**, 305; Ann. Chem. (Liebig), **72**, 329; Chem. Gaz., **1849**, 82.

Separation from cobalt, nickel and zinc by heating the oxides in an atmosphere of sulphuretted hydrogen and treatment of the sulphides with acetic or dilute hydrochloric acid.

1850: 1. DAVY, E. (Proceedings.)

Proc. Irish Acad., **4**, 345.

Substance heated with flowers of sulphur, the mass extracted with water, and the manganese precipitated as ferrocyanide.

1851: 1. LAMING, R. On the Quantitative Estimation of Manganese.

Phil. Mag. (4), **1**, 517; Dingl. pol. J., **121**, 77.

Precipitation as carbonate; also a study of the stability of the carbonate.

1851: 2. MÜLLER, L. Prüfung des Braunsteins und Chlorkalks auf deren Gehalt an Mangansuperoxyd und wirksames Chlor.

Ann. Chem. (Liebig), **80**, 98; Pol. Centrbl., **1852**, 312; Jsb. Chem., **1851**, 635; Chem. Centrbl., **1852**, 266; Chem. Gaz., **1852**, 75; Dingl. pol. J., **124**, 50; Arch. Pharm., **121**, 306.

Determination of peroxide by passing chlorine evolved into stannous chloride solution, and titration of the excess of the latter with ferric chloride.

1851: 3. PERSONNE and LHERMITE. Faits pour servir à l'histoire des acides manganique et hypermanganique.

J. de pharm. (3), **19**, 115; Arch. Pharm., **118**, 181.

Determination of peroxide from loss of weight of strip of copper immersed during solution in sulphuric acid.

1851: 4. SCHABUS. Ueber die Anwendung des chromsauren Kalis zur Eisen-, Braunstein- und Chlorkalkprobe.

Wien Akad. Ber., **6**, 406; J. prakt. Chem., **55**, 368; Dingl. pol. J., **125**, 278; Pol. Centrbl., **1852**, 571; Jsb. Chem., **1851**, 634; Ann. Chem. (Liebig), **80**, 360.

Determination of peroxide by solution with ferrous sulphate and titration for the excess of the latter with potassium bichromate.

1852: 1. CHAPMAN. Detection of Manganese in Limestone Rocks.

Phil. Mag., (4) **3**, 144; Chem. Centrbl., **1853**, 16; Chem. Gaz., **1852**, 60; Arch. Pharm., **124**, 168.

Addition of borax necessary for the success of the usual fusion test.

1852: 2. GIBBS, W. Contributions to Analytical Chemistry.

Am J. Sci. (2), **14**, 204; Chem. Gaz., **1852**, 368; Jsb. Chem., **1852**, 728; Chem. Centrbl., **1853**, 105; J. prakt. Chem., **58**, 241; Ann. Chem. (Liebig), **86**, 57 and 62; Ann. chim. phys. (3), **40**, 233; Arch. Pharm., **124**, 168.

Separation from zinc, nickel, the alkaline earths and alkalies, by precipitation from neutral solutions by lead peroxide. Comments on Crum's method of detection. See 1845: 2.

1853: 1. BUNSEN, R. Ueber eine volumetrische Methode von sehr allgemeiner Anwendbarkeit.

Ann. Chem. (Liebig), **86**, 283; Jsb. Chem., **1853**, 626; Chem. Centrbl., **1853**, 545; Ann. chim. phys., (3), **41**, 339.

Determination by solution in hydrochloric acid, passage of the chlorine into potassium iodide solution, and titration of the iodine with sulphurous acid.

1853: 1a. DEVILLE, H. ST. C. Nouvelle méthode generale d'analyse chimique.

Ann. chim. phys. (3), **38**, 5; J. prakt. Chem., **60**, 9.

Separation from alkalies and alkaline earths by ignition of the nitrates and treatment of the residue with dilute nitric acid.

1853: 2. FLAJOLOT. Sur la séparation de quelques oxydes metalliques.

Ann. des Mines (5), **3**, 641; Ann. chim. phys. (3), **39**, 460; Jsb. Chem., **1853**, 678; Chem. Centrbl., **1854**, 156; C. R. **36**, 1090; Chem. Gaz., **1853**, 380; J. prakt. Chem., **59**, 508; **61**, 110.

Separation from cobalt and zinc by precipitation with sodium carbonate in the presence of potassium cyanide.

1853: 3. HEIZEL. (Title unknown.)

Ztschr. für Pharm., **2**, 32; N. Rep. Pharm., **2**, 271.

Comments on Crum's test. See 1845: 2.

1853: 4. HEMPEL, W. Mémoire sur l'emploi de l'acide oxalique dans les dosage à liqueurs titrées. Lusanne, 1853.

Jsb. Chem., **1853**, 629.

Precipitation by means of sodium hypochlorite, solution of the precipitate in oxalic acid and titration for the excess.

1853: 5. KRIEGER, G. Zur volumetrische Bestimmung der Manganverbindungen.

Ann. Chem. (Liebig), **87**, 257; Jsb. Chem., **1853**, 626; Chem. Gaz., **1853**, 450; Am. J. Sci., (2), **17**, 126; J. prakt. Chem., **61**, 472.

See Bunsen, 1853: 1.

1853: 6. LÖWE, J. Ueber die Entdeckung kleiner Mengen von Mangan auf nassem Wege.

Dingl. pol. J., **130**, 436.

Oxidation to permanganic acid by means of sodium hypochlorite.

1853: 7. LÖWENTHAL, J. Versuche über die Trennung des Zinns von anderen Metallen.

J. prakt. Chem., **60**, 259.

Separation from tin by means of sodium sulphate.

1853: 8. MORFIT, C., and BOOTH, J. C. On the Analysis of Cast Iron.

Chem. Gaz., **1853**, 388 and 411; J. prakt. Chem., **61**, 102.

Separation from iron by means of barium carbonate and precipitation as carbonate.

1853: 9. PARKINSON. (Title unknown.)

Ann. Chem. (Liebig), **86**, 62; Jsb. Chem., **1852**, 730.

Confirmation of Gibbs' results. See 1852: 2.

1853; 10. PRICE. On a New Method for the Determination of the Commercial Value of Oxide of Manganese.

Chem. Gaz., **1853**, 416; Pol. Centrbl., **1854**, 111; Dingl. pol. J., **131**, 34; J. prakt. Chem., **60**, 471.

Determination of peroxide by solution in hydrochloric acid, passage of the chlorine into a solution of arsenious acid, and titration for the excess of the latter with permanganate.

1853: 11. Rivot. (Title unknown.)

Ann. des Mines, 6, 519; Pol. Centrbl., 1853, 821.

Separation from cobalt and nickel.

1853: 12. Schiel, T. Separation of Manganese from Iron and Nickel.

Am. J. Sci. (2), 15, 275; Chem. Centrbl., 1853, 528; Pol. Centrbl., 1853, 1512; J. prakt. Chem., 59, 184; Chem. Gaz., 1853, 413; Arch. Pharm., 115, 162.

Precipitation by chlorine in the presence of sodium acetate.

1854: 1. Davy, E. On Some New and Simple Methods of Detecting Manganese in Natural and Artificial Compounds and of Obtaining its Combinations for Economical Uses.

Proc. Roy. Soc. (Lond)., 6, 385; Jsb. Chem., 1854, 734; Chem. Centrbl., 1854, 415; Chem. Gaz., 1854, 117; Phil. Mag. (4), 7, 222; J. prakt. Chem., 61, 448; Arch. Pharm., 130, 39.

Detection by fusion with potassium hydroxide. Also by ignition with sulphur, oxidation to sulphate, solution, and precipitation with potassium ferrocyanide. See 1850: 1.

1854: 2. Streng, A. Ueber eine allgemein Anwendbare Bestimmungsmethode auf maassanalytischem Wege.

Ann. der Phys. (Pogg.), 92, 71; Dingl. pol. J., 133, 220; Jsb. Chem., 1854, 720; Chem. Centrbl., 1854, 683; Ann. Chem. (Liebig), 92, 414; Wagner's Jsb., 1, 20; Chem. Gaz., 1854, 271.

Precipitation by means of hypochlorite, solution in stannous chloride, and titration for the excess of the latter with potassium bichromate, using iodo-starch indicator.

1855: 1. Mohr, F. Ueber Oxydations- und Reductionsanalysen.

Ann. Chem. (Liebig), 93, 51; Dingl. pol. J., 135, 289; Wagner's Jsb., 1, 19.

Criticism of Streng's procedure. See 1854: 2.

1855: 2. Müller, L. Chemische Mittheilungen.

Dingl. pol. J., 138, 116.

Criticism of Streng. See 1854: 2.

1855: 3. Fresenius, R. Ueber das Trocknen des Braunsteins zum Behuf seine Prüfung.

Ding. pol. J., 135, 277; Pol. Centrbl., 1855, 693 and 745; Wagner's Jsb., 1, 19.

Discussion of the temperature which should be employed to dry pyrolusite before analysis.

1856: 1. Gurlt, A. On the Compounds of Carbon and Iron and their Influence on the Production of Pig Iron.

Chem. Gaz., 14, 260.

Separation from iron by means of sodium bicarbonate. Precipitation by potassium hydroxide and ignition.

1856: 2. SCHREINER, E. Prüfung einiger Sorten käuflichen gepulverten Braunsteins.

Vierteljschr. für Pharm. (Wittstein), **5**, 236; Dingl. pol. J., **140**, 105; Pol. Centrbl., **1856**, 955.

Addition of pyrolusite to ferrous sulphate solution until the iron is oxidized. (A crude method.)

1857: 1. BARRESWIL. Sur quelques procédés d'analyse applicable aux recherches mineralogiques.

C. R., **44**, 677; Chem. Centrbl., **1857**, 449; Jsb. Chem., **1857**, 592; L'Inst., **25**, 114; Chem. Gaz., **1857**, 291; J. de pharm. (3), **31**, 342; J. prakt. Chem., **71**, 317; Arch. Pharm., **147**, 46.

Detection by means of the violet color produced by sirupy phosphoric acid or salt of phosphorus.

1857: 2. BÖTTGER, R. Ueber das Verhalten verschiedenen Stoffe zu geschmolzenen reinen chlorsauren Kali.

Rep. für Pharm. (Buchner), **6**, 247; J. phys. Ver. zu Frankfurt, **1856**, 27; J. prakt. Chem., **70**, 433; Chem. Centrbl., **1857**, 635; Jsb. Chem., **1857**, 136; Pol. Centrbl., **1857**, 886; Pol. Notizbl., **12**, 129; Arch. Pharm., **146**, 288.

Detection by the color produced when the substance is brought into contact with fused potassium chlorate.

1857: 3. FIELD, F. On the Separation of Iron and Manganese.

Chem. Gaz., **1857**, 374; Jsb. Chem., **1857**, 592; Dingl. pol. J., **146**, 315.

Separation by means of lead oxide. (PbO).

1857: 4. TERREIL, A. Note sur le dosage du manganèse, du nickel, du cobalt et du zinc.

C. R. **45**, 652; J. de pharm. (3), **32**, 383; Dingl. pol. J., **149**, 265; Jsb. Chem., **1857**, 593; L'Inst., **25**, 366; Chem. Gaz., **1857**, 452; J. prakt. Chem., **73**, 481; Monit. scientif., **1**, 607; Arch. Pharm., **151**, 306.

Influence of ammonium salts on the precipitation as sulphide.

1858: 1. HEMPEL, C. W. Verhalten von Jod- und Bromkalium gegen die höheren Oxyde des Mangans.

Ann. Chem. (Liebig), **107**, 101.

Determination of peroxide by directly heating the substance with potassium iodide and acid, and titration for the iodine liberated.

1858: 2. HENRY, T. H. On the Separation of Nickel and Cobalt from Manganese.

Phil. Mag. (4), **16**, 197; Am. J. Sci. (1869), (2), **47**, 130; Chem. Centrbl., **1859**, 94; Jsb. Chem., **1858**, 619; J. prakt. Chem., **76**, 252.

Separation by means of phosphoric acid in the presence of an excess of ammonia and ammonium chloride.

1858: 3. ROSE, H. Ueber die Lösungen der Manganoxydsalze und über die Walter Crum'sche Reaction insbesondere.

* Monatsber. Akad. Wiss. (Berlin), Nov., **1858**; Rep. für Pharm., **8**, 81.

See title.

1858: 4. SPILLER, J. On Some Remarkable Circumstances Tending to Disguise the Presence of Various Acids and Bases in Chemical Analysis.

J. Chem. Soc. (Lond.), **10**, 114 and 117.

Effect of citrates and grape sugar upon the precipitation of manganese.

1859: 1. FIKENTSCHER, F. C. Prüfung der Braunsteinerze auf Sauerstoffgehalt.

J. prakt. Chem., **17**, 173; Wagner's Jsb., **5**, 65.

Determination of peroxide from the loss of weight suffered by a strip of copper immersed during the solution in hydrochloric acid.

1859: 2. NOLTÉ, G. Untersuchung des Braunsteins auf seinen Gehalt an Mangansuperoxyd.

Berg- u. hüttenm. Ztg., **18**, 149; Ding. pol. J., **152**, 136; Chem. Gaz., **1859**, 288; Pol. Centrbl., **1859**, 1079; Chem. Centrbl., **1859**, 414; Wagner's Jsb., **5**, 65; Arch. Pharm., **157**, 187.

Comments and experiments upon procedure of Fikentscher. See 1859: 1.

1859: 3. VON KOBELL. Ueber die Anwendung des phosphorsauren Manganoxyds in der Titriranalyse, und der Phosphorsäure zur Mineralbestimmung.

J. prakt. Chem., **76**, 415.

Detection by means of violet color produced by phosphoric acid.

1860: 1. FIELD, F. On the Separation of the Oxides of Nickel and Cobalt from Peroxide of Iron.

Chem. News, **1**, 4.

Separation from iron by means of lead oxide (PbO).

1860: 2. GORGEU, A. Sur une combinaison de permanganate et de manganate de potasse.

C. R., **50**, 610.

Precipitation by means of ammonium sulphide and ignition to mangano-manganic oxide.

1860: 3. LENSSEN, E. Volumetrische Bestimmung des Manganoxyduls.

J. prakt. Chem., **80**, 408; Jsb. Chem., **1860**, 655; Chem. Centrbl. **1861**, 78; Rep. chim. pure, **3**, 139.

Volumetric determination by reduction of potassium ferricyanide and titration for the ferrocyanide with permanganate.

1860: 4. Machnea, M. Note sur la composition du permanganate de potasse.

C. R., 51, 140.

Determination by the method of Gay-Lussac. Also by the determination of the chlorine evolved, with the aid of arsenious or sulphurous acid.

1860: 5. Rose, H. Chemisch-analytische Beiträge; Ueber die Bestimmung der Mengen von Metall in Schwefelverbindungen.

Ann. der Phys. (Pogg.), 110, 122; Jsb. Chem., 1860, 644; Chem. Centrbl., 1860, 583; Ztschr. Chem., 1860, 557; Rep. chim. pure, 2, 391.

Precipitation as sulphide and ignition in hydrogen.

1860: 6. Rose, H. Chemisch-analytische Beiträge; Bestimmung des Mangans; Trennung des Manganoxyduls von Thonerde, Magnesia, Kalkerde und Eisenoxyd.

Ann. der Phys. (Pogg.), 110, 301; Chem. News, 2, 266 and 302; J. prakt. Chem., 84, 23 and 27; Rep. chim. pure, 2, 457; Arch. Pharm., 161, 57.

Precipitation as sulphide and weighing as such. Separation from aluminium by means of ammonia in the presence of ammonium chloride; from magnesium and calcium by means of chlorine.

1860: 7. Rose, H. Chemisch-analytische Beiträge; Trennung des Kobaltoxyds vom Nickeloxyd.

Ann. der Phys. (Pogg.), 110, 412; Jsb. Chem., 1860, 656; Ztschr. Chem., 1860, 622; Rep. chim. pure, 3, 91.

Separation from nickel or zinc by means of lead peroxide in neutral solution. See Gibbs, 1852: 2.

1861: 1. Fresenius, R. Ueber den Einfluss von freiem Ammon und von Ammonsalzen auf die Fällung des Nickels, Kobalts, Zinks, Mangans, Eisens, und Urans durch Schwefelammonium.

J. prakt. Chem., 82, 257; Chem. Centrbl., 1861, 525; Chem. News, 4, 150; Rep. chim. pure, 3, 66.

Precipitation as sulphide.

1861: 2. Kolbe, H. Directe quantitative Bestimmung der Kohlensäure, kohlensaure Salze, und Braunsteinanalyse.

Ann. Chem. (Liebig), 119, 129; Dingl. pol. J., 161, 373.

Determination of peroxide by weighing the carbon dioxide evolved from oxalic acid on solution of pyrolusite.

1861: 3. Mohr, F. Bestimmung der verschiedenen Oxydationsstufen im Braunstein.

Ann. Chem. (Liebig), 117, 382; Jsb. Chem., 1861, 850; Rep. chim. pure, 3, 254.

Determination of the available oxygen in the original specimen and also after ignition.

1861: 4. MÖLLER. Analyse des Tritomits von Brevig.

Ann. Chem. (Liebig), **120**, 243; Ztschr. anal. Chem., **1**, 217.

Separation from iron, alumina, and alkaline earths by chlorine, and determination by the method of Bunsen.

1861: 5. QUADRAT, B. Ueber Methode zur Prüfung des Braunsteins auf seinen Handelswerth. (*Title from Pol. Centrbl.*)

* Schweiz. pol. Ztschr., **6**, 103; Pol. Centrbl., **1861**, 683; Ztschr. Chem., **1861**, 605; Wagner's Jsb., **7**, 143.

Determination of peroxide from the loss of weight of strip of copper immersed during solution of the pyrolusite in hydrochloric acid.

1861: 6. ROSE, H. Chemisch-analytische Beiträge; Trennung des Zinns von Mangan.

Ann. der Phys. (Pogg.), **112**, 172; Chem. News, **5**, 86; Jsb. Chem., **1861**, 855; Ztschr. Chem., **1861**, 281; Rep. chim. pure, **3**, 389.

Separation by means of sulphuric acid.

1862: 1. ABEL, F. A. On the Chemical Examination of Iron Samples and of the Materials Employed in their Manufacture.

Chem. News, **6**, 123; Rep. chim. appl., **5**, 26.

Separation from iron by the acetate method, precipitation by means of bromine in ammoniacal solution, and ignition to mangano-manganic oxide.

1862: 2. RÖHR, R. Zur Braunsteinprüfung.

Ztschr. anal. Chem., **1**, 48; Jsb. Chem., **1861**, 850.

Treatment of pyrolusite with dilute sulphuric acid before the application of the Fresenius-Will method.

1862: 3. SIMMLER, T. Beiträge zur chemischen Analyse durch Spectralbeobachtungen.

Ann. der Phys. (Pogg.), **115**, 425; Ztschr. anal. Chem., **1**, 356.

Spectrum produced by manganous chloride.

1863: 1. FRESENIUS, R. Missbrauch bei Braunsteinanalysen.

Ztschr. anal. Chem., **2**, 346; Chem. Centrbl., **1864**, 511; Pol. Centrbl., **1864**, 826; Chem.-techn. Rep., **3**, a, 105; Dingl. pol. J., **172** 73.

Comments on the application of the Fresenius-Will method to specimens of pyrolusite containing carbonates.

1863: 2. GUYARD, A. Du dosage direct du manganèse, de l'antimoine, et de l'uranium par la méthode des volumes, et de quelques composés de ces métaux.

Bull. soc. chim. (2), **1**, 89; Chem. Centrbl., **1864**, 339; Jsb. Chem., **1863**, 679; J. de pharm. (3), **45**, 409; Chem. News, **8**, 292; Ztschr. anal. Chem., **3**, 373.

Volumetric determination by means of potassium permanganate.

1863: 3. LIPPERT, G. Beiträge zur Analyse des Roheisens.

Ztschr. anal. Chem., 2, 43.

Separation from iron by boiling the nearly neutral solution of the chlorides. Precipitation as sulphide and weighing as such. Separation from nickel and zinc through the solubilities of the sulphides.

1864: 1. CROOKES, W. On Thallium.

J. Chem. Soc. (Lond.), 2, 143.

Separation from thallium by means of potassium iodide.

1864: 2. FRESENIUS, R. Versuche betreffend die von E. Lenssen angegebenen maassanalytische Bestimmung des Mangans durch Reduction von Ferridcyankalium.

Ztschr. anal. Chem., 3, 209; Jsb. Chem., 1864, 707.

Experimental data bearing upon the method of Lenssen. See 1860: 3.

1864: 3. GIBBS, W. On the Quantitative Separation of Cerium from Yttrium, Aluminium, Glucinum, Manganese, Iron, and Uranium.

Am. J. Sci. (2), 37, 354; Ztschr. anal. Chem., 3, 397.

Separation from cerium by means of sodium sulphate.

1864: 4. MITTENZWEY, M. Beitrag zur volumetrischen Bestimmung der Gerbsäure, Gallussäure, sowie des Eisens, Mangans, u. s. w.

J. prakt. Chem., 91, 86 and 87; Pol. Centrbl., 1864, 895; Dingl. pol. J., 173, 294; Jsb. Chem., 1864, 680; Chem. Centrbl., 1864, 551; Ztschr. anal. Chem., 3, 371; Chem. News, 9, 253; Bull. soc. chim. (2), 3, 131.

Determination from the volume of oxygen absorbed when alkaline solutions of manganous salts are shaken with air.

1864: 5. ————. Braunsteinprobe.

Berg- u. hüttenm. Ztg., 23, 374; Pol. Centrbl., 1865, 67; Dingl. pol. J., 174, 299.

Procedure of Nolté as used at "Grube Kaiser Franz." See 1859: 2.

1864: 6. WINKLER, C. Ueber die volumetrische Bestimmung des Kobalts.

Ztschr. anal. Chem., 3, 423.

Titration with permanganate in the presence of mercuric oxide.

1865: 1. Alfraise, P. Méthode de dosage des minerais de manganèse par rapport à la production du chlore.

Monit. scientif., 7, 477.

Solution of ore in presence of stannous chloride, and titration for the excess of the latter with permanganate.

1865: 2. Gibbs, W. On the Separation of Chromium from Aluminium, Iron, Manganese, Cobalt, Nickel, Zinc, and Magnesium; On the Employment of Acetate of Sodium for the Separation of Iron and Aluminium from other Bases; On the Separation of Manganese from Cobalt, Nickel, and Zinc.

Am. J. Sci. (2), **39**, 58; Ztschr. anal. Chem., **3**, 331; Chem. Centrbl., **1865**, 405; Jsb. Chem., **1865**, 712; J. prakt. Chem., **95**, 356; Ztschr. Chem., **1865**, 307; Dingl. pol. J., **178**, 133; Chem. News, **11**, 101 and 147; Bull. soc. chim. (2), **6**, 126.

Separation from chromium by means of chlorine or lead peroxide in alkaline solution; separation from zinc, cobalt, and nickel by means of sulphuretted hydrogen in acetic acid solution.

1865: 3. Habich, R. Maassanalytische Bestimmung des Mangans mit übermangansaurem Kali nach Guyard.

Ztschr. anal. Chem., **3**, 474; Jsb. Chem., **1865**, 713; Ztschr. Chem., **1865**, 473; Chem. News, **12**, 58.

Comments on Guyard method. See 1863: 2.

1865: 4. Luckow, C. Ueber Elektro-Metallanalyse.

Dingl. pol. J., **177**, 231 and 296; **178**, 42; Jsb. Chem., **1865**, 686.

Precipitation of the peroxide by electrolysis.

1865: 5. Rube, C. Ueber die Abscheidung des Mangans bei analytischen Arbeiten.

J. prakt. Chem., **94**, 246; Chem. Centrbl., **1865**, 830; Jsb. Chem., **1865**, 711; Ztschr. Chem., **1865**, 347; Ztschr. anal. Chem., **4**, 421; Bull. soc. chim. (2), **4**, 119.

Separation from iron and aluminum by means of mercuric oxide.

1865: 6. Warington, R., Jr. On the Presence of Manganese in Oolite and Lias.

J. Chem. Soc. (Lond.), **3**, 206.

Precipitation by means of chlorine, and ignition to mangano-manganic oxide.

1866: 1. Bunsen, R. Flammenreactionen.

Ann. Chem. (Liebig), **138**, 291; Phil. Mag. (4), **32**, 104; Jsb. Chem., **1866**, 782; Ztschr. anal. Chem., **5**, 376.

Blowpipe reactions.

1866: 2. Eggertz, V. Ueber die Bestimmung des Mangangehaltes in Eisen und Eisenerzen.

* Jern.- Kont. Ann., **1866**, Heft 3; Berg- u. hüttenm. Ztg., **26**, 187; Monit. scient. (1868), **10**, 25; Jsb. Chem., **1868**, 872; * Schweiz. pol. Ztschr., **1867**, 154; Ztschr. Chem., **1868**, 507; Ztschr. anal. Chem., **7**, 495; Bull. soc. chim. (2), **11**, 238; Chem. News, **18**, 232; Wagner's Jsb., **13**, 12.

Separation from iron by the acetate method, precipitation by means of bromine, and drying and weighing of the precipitated peroxide.

1866: 3. Fröhde, A. Anwendung des unterschwefligsauren Natrons zur qualitativen und quantitativen Analyse und zur Darstellung von Präparaten.

Arch. Pharm., **177,** 75; Ztschr. anal. Chem., **5,** 396.

Separation from cobalt and nickel by heating with sodium thiosulphate and removing the manganous sulphide by dilute acids.

1866: 4. Reichardt, E. Ueber die Bestimmung und Scheidung von Manganoxydul, Eisenoxyd und-oxydul.

Ztschr. anal. Chem., **5,** 60; Arch. Pharm., **179,** 234; Vjschr. Pharm. (Wittstein), **16,** 394; Ztschr. Chem., **1866,** 592; Bull. soc. chim. (2), **7,** 495; Jsb. Chem., **1866,** 800.

Separation from ferrous and ferric iron by the acetate method, precipitation as peroxide by means of sodium hypochlorite, and ignition to mangano-manganic oxide.

1866: 5. Terreil, A. Séparation du cobalt et du nickel, et séparation du manganèse, du nickel et du cobalt.

Bull. soc. chim. (2), **5,** 88; Dingl. pol. J., **180,** 305; Chem. Centrbl., **1866,** 149; Jsb. Chem., **1866,** 806; C. R., **62,** 139; L'Inst., **1866,** 28; Ztschr. Chem., **9,** 211; Ztschr. anal. Chem., **5,** 113; J. prakt. Chem., **100,** 52; Chem. News, **13,** 133.

Separation from cobalt and nickel by means of potassium permanganate or chlorine, in ammoniacal solution.

1867: 1. Braun, C. D. Zur Bestimmung des wirksamen Sauerstoffs in einigen Sauerstoffsäuren und Metalloxyden, eine Methode von vielfacher Anwendbarkeit.

Ztschr. anal. Chem., **6,** 66 and 73; Jsb. Chem., **1867,** 845; Chem. Centrbl., **1867,** 396; Ztschr. Chem., **1867,** 541; Chem.-techn. Rep., **6,** b, 96.

Detection by fusion with sodium pyrophosphate, or by heating the solution to be tested with phosphoric acid in the presence of lead peroxide. Determination by passing the chlorine evolved from the action of hydrochloric acid into a ferrous salt solution, and titration for the unoxidized iron.

1867: 2. Forbes, D. Analysis of Blister Steel.

Chem. News, **16,** 105; Chem. Centrbl., **1869,** 37.

Separation from iron by means of barium carbonate, precipitation by means of ammonium sulphide, solution of the precipitate in sulphuric acid, re-precipitation as carbonate, and ignition to mangano-manganic oxide.

1867: 3. Gibbs, W. On the Estimation of Manganese as Pyrophosphate.

Am. J. Sci. (2), **44,** 216; Jsb. Chem., **1867,** 845; Ztschr. Chem., **1867,** 721; J. prakt. Chem., **103,** 395; Ztschr. anal. Chem., **7,** 101; Bull. soc. chim. (2), **9,** 201; Chem. News, **17,** 195.

See title.

1867: 4. TOSH, E. G. On the Analysis of Cast Iron.

Chem. News, **16,** 168.

Separation from iron by the acetate method, precipitation as sulphide, re-precipitation as the carbonate, and ignition to mangano-manganic oxide.

1868: 1. BRAUN, C. D. Ueber das Verhalten der Manganoxydulsalze zu den Natronsalzen der Phosphorsäure bei Anwesenheit wirksamen Sauerstoffs.

Ztschr. anal. Chem., **7,** 340; Jsb. Chem., **1868,** 227; Ztschr. Chem., **1869,** 306.

Detection by heating with phosphoric acid and lead peroxide. See also 1867: 1.

1868: 2. JUETTE. Sur une méthode de dosage de l'acide tartarique et de l'acide malique, au moyen du fer, de l'aluminium, du manganèse, etc., et réciproquement.

C. R., **66,** 417; Chem. News, **18,** 63; Bull. soc. chim. (2), **10,** 28.

Volumetric estimation by titration with tartaric or malic acid in alkaline solution.

1868: 3. LUNGE, G. Ueber die analytischen Arbeiten in Sodafabriken.

Dingl. pol. J., **186,** 205; Chem. Centrbl., **1868,** 1071.

Determination of the peroxide by passing the chlorine evolved under the action of hydrochloric acid, into a ferrous salt solution, and titration for the unoxidized iron.

1868: 4. TERREIL, A. Action des solutions salines sur les minéraux.

C. R., **66,** 668; Ztschr. Chem., **11,** 337; Chem. News, **13,** 45.

Separation from magnesium and zinc by means of ammonium sulphide in the presence of a large amount of ammonium salts.

1869: 1. CLASSEN, A. Ueber die Fällung und Bestimmung des Mangans durch Anwendung von Schwefelammonium.

Ztschr. anal. Chem., **8,** 370; Chem. Centrbl., **1870,** 530; Jsb. Chem., **1869,** 887; Ztschr. Chem., **1870,** 285; Bull. soc. chim. (2), **14,** 44; Chem.-techn. Rep., **9,** b, 122.

Some conditions under which precipitation as sulphide is incomplete.

1869: 2. DAMOUR, A. Notice sur la Jakobsite: nouvelle espêce minérale.

C. R., **69,** 168; Jsb. Chem., **1869,** 891; L'Inst., **1869,** 243.

Separation from iron by the acetate method and from magnesium by means of hydrogen peroxide.

1869: 3. GALETTI, M. Abänderung der Methoden zur volumetrischen Bestimmung des in Erzen enthaltenen Kupfers und Zinks mit einer Normallösung von Ferrocyankalium.

Ztschr. anal. Chem., **8,** 137.

Separation from zinc in alkaline solution by means of bromine.

1869: 4. How. On the Non-Precipitation of Manganese by Sulphide of Ammonium in Presence of some Organic Ammoniacal Salts.

Chem. News, **19**, 137; Jsb. Chem., **1869**, 887; Bull. soc. chim. (2), **13**, 48; Ztschr. Chem., **1869**, 414; Ztschr. anal. Chem., **9**, 382.

Influence of oxalic, tartaric, and citric acids on the precipitation as sulphide.

1869: 5. Luckow, C. Bestimmung des Kupfers in Mansfelder Schiefern.

Ztschr. anal. Chem., **8**, 24.

Electrolytic separation from copper.

1869: 6. Mohr, F. Zur Braunsteinanalyse.

Ztschr. anal. Chem., **8**, 314; Chem. News, **22**, 236.

Determination of manganese peroxide in pyrolusite. Comments on the Fresenius and Will method. See 1843: 3.

1869: 7. Muck. Ueber die Fällbarkeit des Kobalts durch Schwefelwasserstoff und Reinigung kobalthaltiger Mangansalze.

Ztschr. Chem., **12**, 626; Bull. soc. chim. (2), **13**, 334.

Precipitation of cobalt from a solution containing manganous carbonate by means of hydrogen sulphide.

1869: 8. Prior, M. E. Ueber der Zusammensetzung der Mangancarbonate.

Ztschr. anal. Chem., **8**, 428; Jsb. Chem., **1869**, 886; Ztschr. Chem., **1870**, 274; Bull. soc. chim. (2), **14**, 194.

Determination by precipitation as carbonate. Determination of manganese peroxide by passing the chlorine evolved from the action of hydrochloric acid into a ferrous salt solution and titrating for the unoxidized iron.

1869: 9. Renard, A. De l'emploi du phosphate de soude pour l'élimination du manganèse dans l'analyse volumétrique des minerais de zinc.

Bull. soc. chim. (2), **11**, 473; Chem. Centrbl., **1870**, 224; Ztschr. anal. Chem., **8**, 460; Chem. News, **20**, 35; Ztschr. Chem., **1869**, 662.

Separation from zinc by means of phosphates in ammoniacal solution.

1869: 10. Sherer, E., and Rumpf, G. On the Estimation of Peroxide of Manganese in Manganese Ores.

Chem. News, **20**, 302; **21**, 48; Jsb. Chem., **1869**, 889; Ztschr. Chem., **1870**, 478.

Comparison of the method of Fresenius and Will with the Bunsen method; also discussion of the iron method, and passage of chlorine into milk of lime and titration with arsenious acid.

1869: 11. TESCHENMACHER, E. F., and SMITH, J. D. Zur Braunsteinprüfung.

Ztschr. anal. Chem., **8**, 509; Ztschr. Chem., **13**, 287; Jsb. Chem., **1869**, 888.
Comparison of the results obtained by the method of Fresenius and Will and by the iron method.

1870: 1. FRESENIUS, R. Zur Analyse von Körpern welche beim Erhitzen mit Salzsäure Chlor entwickeln.

Ztschr. anal. Chem., **9**, 63; Jsb. Chem., **1870**, 993; Ztschr. Chem. **1870**, 479.
Criticisms of Bunsen's method for the determination of peroxide in pyrolusite.

1870: 2. GIBBS, W. On the Precipitation of Copper and Nickel by Alkaline Carbonates.

Am. J. Sci. (2), **44**, 213; Chem. Centrbl., **1870**, 62.
Precipitation of manganese by means of oxalic acid in presence of alcohol.

1870: 3. LEISON, W. G. On the Precipitation and Determination of the Metals of the Magnesium Group in the Form of Oxalates.

Am. J. Sci. (2), **50**, 240; Chem. News, **22**, 210; Chem. Centrbl., **1870**, 706.
Precipitation as oxalate. Comments on Gibbs's method. See 1870:2.

1870: 4. PARKER, J. S. On the Estimation of Manganese in Spiegeleisen.

Chem. News, **22**, 186; Dingl. pol. J., **199**, 49; Chem. Centrbl. **1870**, 725; Berg.- u. hüttenm. Ztg., **30**, 55; Wagner's Jsb., **17**, 13.
Influence of copper on the precipitation of manganese as hydrated peroxide.

1870: 5. PATTINSON, J. On the Estimation of Peroxide of Manganese in Manganese Ores.

Chem. News, **21**, 267; Am. Chemist, **1870**, 141; Ztschr. anal. Chem., **9**, 509; Chem. Centrbl., **1870**, 636; Jsb. Chem., **1870**, 991; Bull. soc. chim. (2), **14**, 347; Pol. Centrbl., **1871**, 117 and 1568; Berg- u. hüttenm. Ztg., **29**, 347; Ztschr. Chem., **1870**, 442; Chem.-techn. Rep. **10 a**, 146; Dingl. pol. J., **197**, 422; Wagner's Jsb., **16**, 183.
Refers to Fresenius and Will's, Sherer and Rumpf's, and Bunsen's methods.

1870: 6. PAUL, B. H. On the Testing of Manganese Ores.

Chem. News, **21**, 16; Ztschr. anal. Chem., **9**, 410.
Solution of the ore in oxalic acid and titration for the excess with potassium permanganate.

1870: 7. Pollacci, E. Présence du manganèse dans le lait et dans le sang.

J. de pharm. (4), **11**, 375; Chem. News, **21**, 274; Quart. J. Sci., **7**, 530.
Qualitative test for manganese in milk and blood by means of lead peroxide in nitric acid solution of the ash.

1870: 8. Rowan, T. On the Estimation of Manganese in Spiegeleisen and Ferro-manganese.

Eng., **9**, 455; Dingl. pol. J., **197**, 330; Chem. Centrbl., **1870**, 592; Jsb. Chem., **1870**, 993; Chem.-techn. Rep., **9**, b, 126; Wagner's Jsb., **16**, 13; Berg- u. hüttenm. Ztg., **29**, 347.
Separation from iron by the acetate method, precipitation by chlorine, and re-precipitation as carbonate.

1870: 9. Sherer, E. Assay of Manganese Ores.

Chem. News, **21**, 284; Ztschr. anal. Chem., **9**, 513; Am. Chemist, **1**, 144; Berg- u. hüttenm. Ztg., **30**, 312.
Comments on Pattinson article. See 1870 : 5.

1870: 10. Sherer, E., and Rumpf, G. Ueber die verschiedenen Methoden der Braunsteinprüfung.

Ztschr. anal. Chem., **9**, 46; Jsb. Chem., **1869**, 889; Ztschr. Chem. **1870**, 478; Chem. News, **22**, 227; N. Jahrb. Pharm., **34**, 211; Pol. Centrbl., **1870**, 46.
See 1869 : 10.

1870: 11. Talbott, J. H. A New Analytical Process.

Am. J. Sci. (2), **50**, 244; Chem. Centrbl., **1870**, 707; Jsb. Chem., **1871**, 928; Chem.-techn. Rep., **10**, a, 147; Ber., **4**, 279.
Precipitation as sulphide and re-precipitation as phosphate.

1870: 12. Tissandier, G. Méthodes d'analyse et composition des produits chimiques industrielles.

Monit. scientif., **12**, 277.
Valuation of "manganese" of commerce. Formation of hypochlorite from chlorine evolved, and titration with arsenious acid.

1871: 1. Allen, A. H. On the Employment of Potassium Ferricyanide as a Test for Cobalt, Nickel, and Manganese.

Chem. News, **23**, 290; Jsb. Chem., **1871**, 930; Bull. soc. chim. (2), **16**, 93; J. Chem. Soc. (Lond.), **24**, 757; Ztschr. anal. Chem., **11**, 79; Ztschr. Chem., **1871**, 413.
Detection by means of potassium ferricyanide.

1871: 2. Chatard, T. M. Contribution to Chemistry from the Laboratory of the Lawrence Scientific School.

Am. J. Sci. (3), **1**, 419; Jsb. Chem., **1871**, 928; Chem. Centrbl., **1871**, 426; Chem. News, **24**, 196; Ztschr. anal. Chem., **11**, 308; J. Chem. Soc. (Lond.), **26**, 531.
Quantitative application of Crum's test. Ammonium oxalate employed to titrate for the permanganic acid. See 1845 : 2.

1871: 3. Kämmerer, H. Ueber die Anwendung des Broms statt des Chlors zu analytischen Zwecken.

Ber., **4**, 218; Jsb. Chem., **1871**, 866; Ztschr. Chem., **1871**, 444; Ztschr. anal. Chem., **10**, 464.
Recommends use of bromine for manganese precipitations.

1871: 4. Luck, E. Beiträge zur Braunsteinanalyse nach den Fresenius- Will'schen Verfahren.

Ztschr. anal. Chem., **10**, 310; Jsb. Chem., **1871**, 929; J. Chem. Soc. (Lond.), **25**, 264; Dingl. pol. J., **202**, 305; Pol. Centrbl., 1871, 1568.
Determination of the accuracy of the method.

1871: 5. Rowan, T. On the Estimation of Manganese in Spiegeleisen and Ferro-manganese.

Chem. News, **23**, 279; J. Chem. Soc. (Lond.), **24**, 756; Am. Chemist, **2**, 75.
Precipitation of manganese as carbonate.

1871: 6. Tamm, H. On a New Method of Estimating Zinc.

Chem. News, **24**, 150; Jsb. Chem., **1871**, 932; Ztschr. Chem., **14**, 467; Bull. soc. chim. (2), **16**, 261.
Determination of manganese as phosphate.

1872: 1. Allen, A. H. Estimation of Manganese.

Chem. News, **26**, 81.
Comments on Tamm's article. See 1871: 6.

1872: 2. Böttger, R. Nachweisung von Spuren von Mangan.

*Jsb. phys. Ver. Frankfurt, **10**, 388; Vierteljsb. prakt. Pharm., **21**, 418; Jsb. Chem., **1872**, 911; Ztschr. anal. Chem., **1872**, 433; Chem. News, **24**, 192; Chem.-techn. Rep., **10**, b, 150; J. Frank. Inst., **93**, 87.
Detection of small amounts of manganese by contact of substance with fused potassium chlorate.

1872: 3. Fresenius, R. Ueber die Bestimmung des Mangans auf gewichtsanalytischem Wege.

Ztschr. anal. Chem., **11**, 290 and 413; Jsb. Chem., **1872**, 908; Am. Chemist, **3**, 472; J. Chem. Soc. (Lond.), **26**, 409.
Determination as protosesquioxide after precipitation as manganous carbonate, hydroxide, hydrated peroxide (Guyard), or oxalate; as pyrophosphate (Gibbs) or as sulphide (Fresenius, Classen).

1872: 4. Horner. The Spectra of Manganese in Blowpipe Beads.

Chem. News, **25**, 139; J. Chem. Soc. (Lond.), **25**, 524.
Detection by means of absorption spectra of blowpipe beads.

1872: 5. KESSLER, F. Beiträge zur Analyse des Roheisens und Stahls.

Ztschr. anal. Chem., **11**, 255; Monit. scientif., **15**, 826: Chem. News, **28**, 158.

Separation from iron by acetate and sulphate methods. Precipitation of manganese by bromine, solution in antimonious chloride, and titration with potassium permanganate.

1872: 6. KESSLER, F. Ueber die Bestimmung des Mangans in Roheisen, Stahl, und Stabeisen.

Ber., **5**, 60[illegible]; Oester. Ztschr. Berg- u. Hüttenw., **20**, 405; Dingl. pol. J., **205**, 332 and 439; Pol. Centrbl., **1872**, 1608; Technologiste, Dec. **1872**; Chem. Centrbl., **1872**, 617; Chem. News, **27**, 14; J. Chem. Soc. (Lond.), **25**, 925; Chem.-techn. Rep., **11**, b, 199; Wagner's Jsb., **19**, 11; Am. Chemist, **4**, 76; Iron, **2**, 326.

See 1872: 5.

1872: 7. LECLERC, A. Dosage du manganèse dans les sols et dans les végétaux.

C. R., **75**, 1209; Chem. News, **26**, 296; Jsb. Chem., **1872**, 910; Chem. Centrbl., **1872**, 88; Bull. soc. chim. (2), **19**, 177; Ztschr. anal. Chem., **12**, 308; Dingl. pol. J., **206**, 366; J. Chem. Soc. (Lond.), **26**, 193; Chem.-techn. Rep., **12**, a, 193; Am. Chemist (1875), **5**, 267; Arch. Pharm., **202**, 268.

Oxidation to permanganic acid by means of lead peroxide, or red lead, and titration with mercurous nitrate.

1872: 8. PICHARD. Dosage du manganèse dans les minerais de fer, les fontes, les aciers, par un procédé colorimetrique.

C. R., **75**, 1821; Dingl. pol. J., **207**, 136; Jsb. Chem., **1872**, 909; Chem. News, **27**, 85; Bull. soc. chim. (2), **19**, 253; Ztschr. anal. Chem., **12**, 308; J. Chem. Soc. (Lond.), **26**, 407; Chem.-techn. Rep., **12**, a, 195; Berg- u. hüttenm. Ztg., **32**, 91.

Oxidation to permanganic acid by means of lead peroxide in nitric acid solution.

1872: 9. DE REZENDE. Note sur un procédé de séparation du fer et du manganèse.

Ann. des Mines (7), **1**, 418.

Separation from iron by means of cupric oxide.

1872: 10. TAMM, H. On an Improved Mode of Estimating Manganese.

Chem. News, **26**, 37; Am. Chemist, **3**, 145; Jsb. Chem., **1872**, 910: Monit. scientif., **14**, 973; Bull. soc. chim. (2), **19**, 121.

Precipitation with ammonium carbonate from solutions containing ammonium chloride. Separation from iron by the succinate method, and from zinc and nickel by ammonium carbonate.

1872: 11. Tamm, H. On the Metallurgy of Manganese, and the Docimastic Assaying of Manganese Ores.

Chem. News, **26**, 111; Am. Chemist, **3**, 177; Pol. Centrbl., **1872**, 1348.
Dry assay with various fluxes.

1873: 1. Brünner, A. Schnell durchführbare colorimetrische Probe auf Mangangehalt des Roheisens, Stahls, Eisens, und Erze.

Oester. Ztschr. Berg- u. Hüttenw., **21**, 341; Chem. Centrbl., **1873**, 757; Bull. soc. chim. (2), **21**, 278; J. Chem. Soc. (Lond.), **27**, 604 and 816; Chem.-techn. Rep., **12**, b, 196; Wagner's Jsb., **20**, 10; Pol. Centrbl., **1873**, 1367; Dingl. pol. J., **210**, 278.
Conversion to sodium manganate and comparison of solutions.

1873: 2. Gibbs, W. On the Estimation of Manganese as Pyrophosphate.

Chem. News, **28**, 51; Jsb. Chem., **1873**, 934; J. Chem. Soc. (Lond.), **27**, 92.
Precipitation by means of salt of phosphorus. See 1867: 3.

1874: 1. Koppmayer, M. Ueber A. Brünner's colorimetrische Probe auf Mangangehalt des Stahls, Eisens, und der Erze.

Dingl. pol. J., **211**, 133; Jsb. Chem., **1874**, 988; Chem. Centrbl., **1874**, 138; J. Chem. Soc. (Lond.), **27**, 1009; Pol. Centrbl., **1874**, 395; Berg- u. hüttenm., Ztg., **33**, 109.
Regards Brünner's method as valueless. See 1873: 1.

1874: 2. Morrell, T. T. Estimation of Manganese.

Am. Chemist, **5**, 213; Jsb. Chem. **1874**, 988.
Colorimetric method depending upon the liberation of iodine in solution, after precipitation by bromine.

1874: 3. Piesse, C. H. The Estimation of Silicon, Graphite, Manganese, Aluminium, and Calcium in Pig Irons.

Chem. News, **29**, 110; Jsb. Chem., **1874**, 986; Bull. soc. chim. (2), **22**, 67; J. Chem. Soc. (Lond.), **27**, 711.
Separation from iron by the basic acetate method and precipitation by bromine.

1874: 4. Parry, J. Estimation of Manganese in Spiegeleisen.

Chem. News, **29**, 86; Jsb. Chem., **1874**, 987; Am. Chemist, **4**, 434; J. Chem. Soc. (Lond.), **27**, 712; Bull. soc. chim. (2), **22**, 68.
Adaptation of Fresenius-Will method, after solution in nitric acid and ignition of the residue left on evaporation.

1874: 5. Pouchet, A. G. Revue des méthodes d'analyse des produits industriels: Titrage et assai des manganèses.

Monit. scientif., **16**, 1139.
Comments of Mohr (1855: 1), Fresenius-Will (1843: 3), and Bunsen (1853: 1) methods for the determination of peroxide; also of method involving oxidation of sulphurous acid by chlorine evolved, and precipitation of barium sulphate. Outlines of

methods for the determination of total acid consumed, and of manganese in "Weldon Mud."

1874: 6. WILLIS, A. Estimation of Manganese in Spiegeleisen.

Chem. News, **29**, 150; Jsb. Chem., **1874**, 987.
Comments on Piesse, 1874: 3.

1875: 1. BOUSSINGAULT. Études sur la transformation du fer en acier par la cémentation.

Ann. chim. phys. (5), **5**, 184; Dingl. pol. J., **224**, 80; Jsb. Chem., **1877**, 1061; Chem. Centrbl., **1877**, 376.
Separation from iron by basic acetate method, and precipitation by hypochlorite. Determination of small quantities by means of lead peroxide and titration with mercurous nitrate; also electrolytic deposition.

1875: 1a. BOLTON, H. C. Index to the Literature of Manganese, 1596–1874.

* Annals Lyceum Nat. Hist. N. Y., Nov., **1875**.
Compilation of journal literature on manganese and its compounds.

1875: 2. KERN, S. Estimation of Manganese in Spiegeleisen, Iron, and Steel.

Chem. News, **32**, 100; Jsb. Chem., **1875**, 955; Ztschr. anal. Chem., **16**, 505; J. Chem. Soc. (Lond.), **29**, 110; Chem.-techn. Rep., **14**, a, 278; Wagner's Jsb., **22**, 19; Am. Chemist, **6**, 192.
Precipitation as manganous hydroxide, reduction in hydrogen, separation of iron by magnet, and ignition to protosesquioxide.

1875: 3. LUNGE, G. Ueber die neusten Fortschritte in der Soda- und Chlorkalk-Industrie in England.

Dingl. pol. J., **215**, 157; Pol. Centrbl., **1875**, 853.
Determination in "Weldon Mud" by ferrous sulphate and permanganate.

1875: 4. MORRELL, T. T. Note on the Estimation of Manganese in Spiegeleisen.

Am. Chemist, **6**, 45; Jsb. Chem., **1875**, 954.
Separation from iron by the basic acetate method, precipitation by bromine, and colorimetric determination by the liberation of iodine. (See 1874: 2.)

1875: 5. VOGEL, H. W. Ueber die Absorptionsspectren einiger Salze der Metalle der Eisengruppe und Anwendung in der Analyse.

Ber., **8**, 1533; Dingl. pol. J., **219**, 533.
Detection by means of absorption spectra of permanganic acid.

1876: 1. CAMPANI, G. Il manganese nille ceneri si manifesta facilmente sotto la forma di fosfato manganico.

Gazz. chim. ital., 1876, 464; Jsb. Chem., **1876**, 1000; Chem. News, **35**, 75; J. Chem. Soc. (Lond.), **32**, 223.

Detection in plant ashes by the color of the residue after evaporation with nitric acid.

1876: 2. FRESENIUS, R. Methode zur Analyse alkalischer Mineralwasser.

Ztschr. anal. Chem., **15**, 222 and 225.

Determination in mineral water by precipitation as sulphide and ignition in hydrogen.

1876: 3. GALBRAITH, W. The Determination of Manganese in Spiegeleisen.

Chem. News, **33**, 47; Am. Chemist, **6**, 462; Oester. Ztschr. Berg- u. Hüttenw., **25**, 31; Jsb. Chem., **1876**, 999; Dingl. pol. J., **221**, 448; Ztschr. anal. Chem., **16**, 506; J. Chem. Soc. (Lond.), **28**, 750; Wagner's Jsb., **22**, 18; Berg- u. hüttenm. Ztg., **35**, 355; Chem.-techn. Rep., **15**, 479.

Solution in nitric acid, evaporation and ignition; solution of residue with ferrous ammonium sulphate and titration for the excess.

1876: 4. KERN, S. Estimation of Manganese in Cast Iron.

Chem. News, **33**, 90; J. Chem. Soc. (Lond.), **29**, 962; Dingl. pol. J., **221**, 188; Am. Chemist, **7**, 76; Rev. univers. des Mines, **39**, 199; Bull. soc. chim. (2), **26**, 474.

Precipitation of iron and manganese by potassium hydroxide, solution of manganese by addition of ammonium chloride, filtration, precipitation as sulphide, strong heating with sulphuric acid, and weighing as mangano-manganic oxide.

1876: 5. PETERS, S. On the Estimation of Manganese in Iron and Steel.

Chem. News, **33**, 35; Jsb. Chem., **1876**, 999; Dingl. pol. J., **221**, 486; J. Chem. Soc. (Lond.), **29**, 750; Wagner's Jsb., **22**, 19; Chem.-techn. Rep., **15**, 480.

Colorimetric method. Oxidation to permanganic acid by lead peroxide.

1876: 6. PHIPSON, T. L. Determination of Manganic Oxide.

Chem. News, **34**, 19 and 39.

Determination of manganese peroxide in the presence of sesquioxide.

1877: 1. BOLTON, H. C. Schemes of Analysis Executed in the School of Mines, Columbia College.

Am. Chemist, **7**, 307.

Determination as pyrophosphate (Gibbs' method, 1867: 3).

1877: 2. CHAPMAN, E. J. On Some Blow-pipe Reactions.

Chem. News, **35**, 13 and 26; J. Chem. Soc. (Lond.), **31**, 489.

Detection by means of sodium carbonate.

1877: 3. Classen, A. Quantitative Bestimmung des Mangans durch Fällung als Manganoxalat.

Ztschr. anal. Chem., **16,** 315; J. Chem. Soc. (Lond.), **32,** 804; Dingl. pol. J., **225,** 515; Chem. Centrbl., **1877,** 503; Chem.-techn. Rep., **16,** 636.

Precipitation as oxalate and weighing as protosesquioxide.

1877: 4. Classen, A. Zur Trennung des Mangans von Kalk.

Ztschr. anal. Chem., **16,** 318; Jsb. Chem., **1877,** 1055; Chem. Centrbl., **1877,** 470; J. Chem. Soc. (Lond.), **32,** 805; Dingl. pol. J., **225,** 515; Chem.-techn. Rep., **16,** 636.

Separation by means of oxalic acid not practicable.

1877: 5. Classen, A. Ueber die Abscheidung des Mangans als wasserfreies Sulfür.

Ztschr. anal. Chem., **16,** 319; Jsb. Chem., **1877,** 1062; Chem. Centrbl., **1877,** 470; J. Chem. Soc. (Lond.), **32,** 514.

Precipitation as sulphide in presence of potassium oxalate.

1877: 6. Classen, A. Ueber eine neue Methode zur Trennung des Eisens von Mangan, Kobalt, Nickel und Zink.

Ber., **10,** 1316; Jsb. Chem., **1877,** 1064 and 1066; Chem. Centrbl., **1877,** 602; Ztschr. anal. Chem., **16,** 471; Bull. soc. chim. (2), **30,** 409.

Separation from iron by means of neutral potassium oxalate and acetic acid.

1877: 7. Classen, A. Quantitative Bestimmung von Mangan, Kobalt, Nickel und Zink durch Fällung als Oxalate.

Ber., **10,** 1315; J. Chem. Soc. (Lond.), **32,** 924.

See 1877: 3.

1877: 8. Deby. Determination of Manganese in Spiegel, Iron, and Steel at Terrenoire.

* Report, **1877,** II; Berg- u. hüttenm. Ztg., **37,** 391.

Oxidation to permanganic acid by lead peroxide and titration with arsenious acid.

1877: 9. Funaro, A. Della seperazione quantitativa del ferro e del manganese nei minerali ferro-manganici.

Gazz. chim. ital., **7,** 286; Jsb. Chem., **1877,** 1064; Chem. Centrbl., **1877,** 661; Ber., **10,** 1383; J. Chem. Soc. (Lond.), **32,** 805; Dingl. pol. J., **225,** 610; Chem.-techn. Rep., **16,** 635.

Separation from iron by means of ammonium benzoate or succinate.

1877: 10. Hannay, J. B. Note on a New Manganese Reaction.

J. Chem. Soc. (Lond.), **33,** 269; Jsb. Chem., **1877,** 1063; Chem. Centrbl., **1878,** 41; Chem. News, **36,** 212; Bull. soc. chim. (2), **30,** 412; Ber., **10,** 2052; Chem.-techn. Rep. **16,** 637.

Precipitation by potassium chlorate in nitric acid solution, and determination by gravimetric and volumetric methods.

1877: 11. Kern, S. Quantitative Analysis of Certain Metals in Iron and Steel.

Chem. News, **35**, 67; Jsb. Chem., **1877**, 1057; J. Chem. Soc. (Lond.), **32**, 647; Eng. Min. J., **24**, 127.
Determination in chrome-iron alloys. Usc of sodium hypochlorite for precipitation advised.

1877: 12. Kern, S. On the Estimation of Manganese in Spiegeleisen and Ferro-manganese.

Chem. News, **35**, 247 and 270; Ber., **10**, 975; Jsb. Chem., **1877**, 1062; Chem. Centrbl., **1877**, 457; Dingl. pol. J., **225**, 392; Chem.-techn. Rep., **16**, 635.
Determination in alloys by ignition of mixed oxides of iron and manganese in hydrogen, and then in chlorine, leaving a residue of protosesquioxide. Also direct ignition of the alloy with ammonium chloride.

1877: 13. Krämer, C. Zur Trennung des Mangans von Eisen.

Ztschr. anal. Chem., **16**, 334; Jsb. Chem., **1877**, 1063; J. Chem. Soc. (Lond.), **32**, 805.
Separation from iron by the basic acetate method. See Stöckmann, 1877: 20.

1877: 14. Munroe, C. E. The Estimation of Manganese as Pyrophosphate.

Am. Chemist, **7**, 287; Jsb. Chem., **1877**, 1061; Iron, **9**, 555.
The influence of ammonia upon the determination as phosphate.

1877: 15. Parreño, A. G. Determination du manganèse métallique par la voie volumétrique.

Ann. chim. phys. (5), **11**, 571; Jsb. Chem., **1877**, 1062; Chem. Centrbl., **1877**, 615; Am. J. Sci. (3), **14**, 418; J. Chem. Soc. (Lond.), **32**, 924; Pharm. Centrh., **18**, 396; Chem.-techn. Rep., **16**, 636.
Ignition of mineral to mangano-manganic oxide, treatment with hydrochloric acid and determination of the iodine liberated from potassium iodide, by the chlorine evolved.

1877: 16. Perrey. (Title unknown.)

* Bull. de Rouen, **1877**, 104; Jsb. Chem., **1877**, 1063; Chem. Centrbl., **1878**, 15; Dingl. pol. J., **226**, 194; Chem.-techn. Rep., **16**, 640.
Comparison of Fresenius-Will (1843: 3), Hempel (1858: 1), Gay-Lussac (1829: 1), Mohr (1855: 1), and Bunsen (1853: 1) methods for analysis of pyrolusite.

1877: 17. RICHE, M. A. Note sur la dosage du manganèse, du nickel, du zinc et du plomb.

C. R., **85**, 226; Jsb. Chem., **1877**, 1066; Chem. News, **36**, 96; Ztschr. anal. Chem., **17**, 216; Bull. soc. chim. (2), **29**, 378; Dingl. pol. J., **239**, 380; J. Chem. Soc. (Lond.), **32**, 924; Eng. Min. J., **24**, 222; Chem.-techn. Rep., **16**, 637; Rev. univers. des mines, **2**, 297; Chem. Ind., **7**, 27.

Electrolytic determination.

1877: 18. RILEY, E. On the Estimation of Manganese in Spiegeleisen and Iron in Manganiferous Ores.

J. Iron Steel Inst., **1877**, a, 52; Chem. News, **35**, 175; J. Chem. Soc. (Lond.), **32**, 1; Chem. Centrbl., **1877**, 376; Oester. Ztschr. Berg- u. Hüttenw., **25**, 424; Dingl. pol. J., **227**, 493; Iron, **9**, 617, 711, and 746; Jsb. Chem., **1877**, 1061; Ber., **10**, 911; Bull. soc. chim. (2), **29**, 282; Berg- u. hüttenm. Ztg., **36**, 223; Wagner's Jsb., **23**, 21; Chem.-techn. Rep., **16**, 633.

Separation from iron by the acetate method, precipitation by bromine, and ignition; also determination by difference.

1877: 19. ROSENTHAL, G. Ueber die Fällung des Mangans mit Wasserstoffsuperoxyd.

Dingl. pol. J., **225**, 154; Jsb. Chem., **1877**, 1037; Chem. Centrbl., **1877**, 651; Chem. News, **36**, 147; Ztschr. anal. Chem., **17**, 364; J. Chem. Soc. (Lond.), **32**, 923; Bull. soc. chim. (2), **32**, 364; Berg- u. hüttenm. Ztg., **36**, 324; Chem.-techn. Rep., **16**, 635.

Separation from iron by the acetate method, and precipitation by means of hydrogen peroxide.

1877: 20. STÖCKMANN, C. Ueber die Bestimmung von Mangan und Phosphor im Spiegeleisen.

Ztschr. anal. Chem., **16**, 172; Jsb. Chem., **1877**, 1063; Dingl. pol. J., **225**, 108; J. Chem. Soc. (Lond.), **32**, 648; Chem. News, **36**, 275; Monit. scientif., **19**, 1274.

Separation from iron by the acetate method. See 1877: 13.

1878: 1. BONG, G. Sur un bleu au manganèse.

Bull. soc. chim. (2), **29**, 199; Jsb. Chem., **1878**, 1129.

Detection with the aid of a flux of silica, metallic sodium, and calcium carbonate.

1878: 2. DESHAYES, V. Dosage du manganèse dans les fers, fontes et aciers; dans les spiegels, ferro-manganèses et minerais.

Bull. soc. chim. (2), **29**, 541; Jsb. Chem., **1878**, 1062; Chem. News, **38**, 70; J. Chem. Soc. (Lond.), **34**, 808; Bull. soc. ind. minerale (2), **7**, 163.

Oxidation to permanganic acid by lead peroxide, and titration with arsenious acid.

1878: 3. MATZURKE, G. Zur Trennung von Eisen und Mangan.

Ztschr. anal. Chem., **17**, 78; Jsb. Chem., **1878**, 1061.

Separation from iron by acetate method. See Krämer, 1877: 13.

1878: 4. MORAWSKI, T., and STINGL, J. Ueber eine maassanalytische Bestimmung des Mangans.

J. prakt. Chem. (2), **18**, 96; Jsb. Chem., **1878**, 275; Chem. Centrbl., **1878**, 758; Chem. News, **38**, 297; J. Chem. Soc. (Lond.), **36**, 277; Ztschr. anal. Chem., **18**, 471; Ber., **11**, 1933; Bull. soc. chim. (2), **32**, 603; Chem.-techn. Rep., **17**, b, 241.

Determination by potassium permanganate in slightly acid solution.

1878: 5. MORAWSKI, T., and STINGL, J. Zur Bunsen'schen Braunsteinbestimmungsmethode.

J. prakt. Chem. (2), **18**, 101; Chem. Centrbl., **1878**, 759; Jsb. Chem., **1878**, 275; Ztschr. anal. Chem., **18**, 471; Ber., **11**, 1933; J. Chem. Soc. (Lond.), **36**, 278.

Modification of an apparatus for the Bunsen method for the analysis of pyrolusite.

1878: 6. MÜLLER, F. C. G. Untersuchungen über den Bessemerprocess.

Ber., **11**, 552; Ztschr. Ver. d. Ing., **22**, 467.

Separation from iron by the acetate method and precipitation by chlorine.

1878: 7. PROCHASKA, J. Der Siemens-Martinprocess im Südbahnwalzwerke im Graz.

Oester. Ztschr. Berg- u. Hüttenw., **26**, 116; Berg- u. hüttenm. Ztg., **37**, 147.

Oxidation to permanganate acid by red lead and titration by ferrous sulphate.

1878: 8. RICHE, A. Mémoire sur le dosage du manganèse, du plomb du cuivre, du zinc et du nickel; et sur l'analyse des alliages de ces métaux.

Ann. chim. phys. (5), **13**, 508; Berg- u. hüttenm. Ztg., **37**, 26; Jsb. Chem., **1878**, 1062; J. Chem. Soc. (Lond.), **34**, 750.

Electrolytic determination.

1878: 9. WRIGHT, C. R. A., and LUFF, A. P. Researches on Some Points in Chemical Dynamics.

J. Chem. Soc. (Lond.), **33**, 526.

A study of the oxides of manganese with reference to the bearing of the results reached upon current analytical methods.

1879: 1. BEILSTEIN, F., and JAWEIN, L. Ueber eine directe Trennung des Mangans von Eisen.

Ber., **12**, 1528; Iron, **14**, 587; Jsb. Chem., **1879**, 1045; Chem. News, **40**, 300; Ztschr. anal. Chem., **19**, 77; Chem. Ztg., **3**, 630; Bull. soc. chim. (2), **32**, 604; J. Chem. Soc. (Lond.), **38**, 61; Dingl. pol. J., **234**, 254; Wagner's Jsb., **26**, 320; Monit. scientif., **22**, 811;

J. Am. Chem. Soc., **1**, 533; Berg- u. hüttenm. Ztg., **38**, 360; Am. Chem. J., **2**, 73; Arch. Pharm., **215**, 449; J. Iron Steel Inst., **1880**, 354.

Separation from iron by iodine in cyanide solution; also by precipitation by potassium chlorate in nitric acid; precipitation as sulphide.

1879: 2. CARNOT, A. Sur l'emploi de l'hydrogène sulfuré par voie sèche dans les analyses.

Bull. soc. chim. (2), **32**, 161; C. R., **89**, 167; Jsb. Chem., **1879**, 1024.

Determination as sulphide, with use of Rose crucible. See 1860: 5.

1879: 3. CLASSEN, A. Zur Trennung des Mangans von Zink.

Ztschr. anal. Chem., **18**, 194; Chem. Centrbl., **1879**, 366; J. Chem. Soc. (Lond.), **36**, 1055; Chem. Ztg., **3**, 253; Chem. News, **40**, 33; J. Am. Chem. Soc., **1**, 327.

Criticism of Tamm procedure. See 1872: 10.

1879: 4. CLASSEN, A. Ueber eine neue quantitative analytische Methode von vielfacher Anwendbarkeit.

Ztschr. anal. Chem., **18**, 379, 380, and 396; Chem. News, **40**, 33; Chem. Ztg., **3**, 676; Bull. soc. chim. (2), **35**, 91; J. Chem. Soc. (Lond.), **36**, 969.

Separation from iron and aluminum with the aid of potassium oxalate.

1879: 5. CLASSEN, A. Ueber eine neue Methode zur Trennung des Eisenoxyds und der Thonerde von Mangan.

Ztschr. anal. Chem., **18**, 175; Chem. Centrbl., **1879**, 365; Jsb. Chem., **1879**, 1045; Bull. soc. chim. (2), **33**, 446; J. Chem. Soc. (Lond.), **36**, 1055; J. Am. Chem. Soc., **1**, 325.

See 1879: 4.

1879: 6. KESSLER, F. Ueber die Bestimmung des Mangans, besonders in Eisen-Manganlegirungen.

Ztschr. anal. Chem., **18**, 1; Iron, **13**, 643, 675, and 706; Jsb. Chem., **1879**, 1050; Chem. Centrbl., **1879**, 90; J. Chem. Soc. (Lond.), **36**, 341; Chem. Ztg., **3**, 30; J. Am. Chem. Soc., **1**, 83; Am. Chem. J., **1**, 363; J. Frank. Inst., **107**, 411; Dingl. pol. J., **232**, 91; J. Iron Steel Inst., **1880**, 353.

Separation from iron by means of sodium sulphate, precipitation by bromine, solution of the peroxide by antimonious chloride, and titration with potassium permanganate.

1879: 7. LEDEBUR, A. Zur chemischen Untersuchung des Eisens und seiner Erze.

Berg- u. hüttenm. Ztg., **38**, 47.

Comparison of Kessler (1879: 6), Riley (1877: 18), Müller (1851: 2), the sulphide and indirect methods of determination.

1879: 8. MACKINTOSH, J. B. (Correspondence.)

School Mines Quart., **1**, 127.
Separation from iron by the acetate method, and precipitation by bromine.

1879: 9. PATTINSON, J. On a New Volumetric Method of Determining Manganese in Manganiferous Iron Ores, Spiegeleisen, Steel, etc.

J. Iron Steel Inst., **1879**, a, 209; b, 335; Rev. univers. des mines, **10**, 135.
Precipitation by hypochlorite in the presence of ferric salts, solution by ferrous iron and titration of the excess.

1879: 10. PATTINSON, J. On a Method of Precipitating Manganese entirely as Dioxide and its Application to the Volumetric Determination of Manganese.

J. Chem. Soc. (Lond.), **35**, 365; Chem. News, **39**, 201; Jsb. Chem., **1879**, 1047; Monit. scientif., **22**, 465; Ztschr. anal. Chem., **19**, 346; Ber., **12**, 1025; J. Am. Chem. Soc., **1**, 327; Iron, **13**, 336; **14**, 12; Wagner's Jsb., **26**, 321; Dingl. pol. J., **234**, 160; J. Anal. Chem., **1**, 71.
See 1879: 9.

1879: 11. PICKERING, S. U. On the Reaction between Sodium Thiosulphate and Iodine: Estimation of Manganese Oxides and Potassium Bichromate.

J. Chem. Soc. (Lond.), **37**, 128; Chem. News, **40**, 261; Jsb. Chem., **1880**, 1182; Chem. Centrbl., **1880**, 103; Bull. soc. chim. (2), **36**, 261; Dingl. pol. J., **236**, 350.
Determination of peroxide in pyrolusite by the titration of iodine liberated by the chlorine evolved on solution in hydrochloric acid.

1879: 12. PELLITZ, W. Analyse des Zsadanyer Meteoriten.

Ztschr. anal. Chem., **18**, 64.
Determination in meteorites.

1879: 13. RÖSSLER, C. Ueber eine neue Bestimmung des Mangans mit Anwendung des Volhard'schen Silbertitrirverfahrens.

Ber., **12**, 925; Jsb. Chem., **1879**, 1050; Chem. Centrbl., **1879**, 427; J. Chem. Soc. (Lond.), **36**, 746; Chem. News, **40**, 169; Bull. soc. chim. (2), **33**, 281; Wagner's Jsb., **25**, 16; J. Am. Chem. Soc., **1**, 329; Dingl. pol. J., **233**, 86.
Precipitation with ammoniacal silver nitrate, filtration of the mangano-silver compound, and titration for the excess of the silver by the sulphocyanide procedure.

1879: 14. Volhard, J. Zur Scheidung und Bestimmung des Mangans.

Ann. Chem. (Liebig), **198**, 318; Jsb. Chem., **1879**, 1048; Chem. News, **40**, 207; J. Chem. Soc. (Lond.), **38**, 141; Ztschr. anal. Chem., **20**, 271 and 285; Ber., **12**, 2175; Bull. soc. chim. (2), **34**, 715; Berg- u. hüttenm. Ztg., **39**, 150; J. Iron Steel Inst., 1880, 355.

Volumetric determination by potassium permanganate; separation from iron and aluminum by mercuric or zinc oxide; precipitation by halogens or lead peroxide in neutral solution; determination as manganous sulphate and as mangano-manganic oxide.

1880: 1. Böttger, R. Höchst empfindliche Reaction auf Mangan.

* Technische Blätter; * Tagebl. Natf. Ver. Baden-Baden, **1879**, 193; Chem. Centrbl., **1880**, 249; Jsb. Chem., **1880**, 1181; Oester. Ztschr. Berg- u. Hüttenw., **28**, 416.

See 1872: 2.

1880: 2. Dellfs, H. The Behaviour of Sulphuretted Hydrogen with the Salts of the Heavy Metals.

Chem. News, **41**, 279; Jsb. Chem., **1880**, 1144.

Precipitation by sulphuretted hydrogen in the presence of organic acids.

1880: 3. Drown, T. M., and Shimer, P. W. The Determination of Silicon and Titanium in Pig Iron and Steel.

Trans. Am. Inst. Min. Eng., **8**, 514.

Separation from iron by heating the iron or steel in an atmosphere of chlorine.

1880: 4. Dunston, W. R. The Analysis of Steel.

Pharm. J. Trans. (3), **10**, 594; Jsb. Chem., **1880**, 1180.

Separation from iron by the acetate method, precipitation by bromine, and ignition to mangano-manganic oxide.

1880: 5. Haswell, A. E. Volhard's Titrirung des Mangans mit übermangansaures Kali.

Dingl. pol. J., **235**, 387; Jsb. Chem., **1880**, 1181; Chem. Centrbl., **1880**, 249; Chem. Ztg., **4**, 224; J. Iron Steel Inst., **1882**, 743.

Confirmation of Volhard's procedure. (1879: 14.)

1880: 6. Jewett, J. Influence of Acetic Acid on the Separation of Iron as a Basic Acetate from Manganese, Zinc, Cobalt, and Nickel.

Chem. News, **40**, 273; J. Chem. Soc. (Lond.), **38**, 289.

See title.

1880: 7. v. Jüptner, H. Volhard's Methode der Trennung und Bestimmung des Mangans.

Oester. Ztschr. Berg- u. Hüttenw., **28**, 168.

Favorable comment upon the Volhard method. (1879: 14.)

1880: 8. Jurisch, K. Zur Prüfung des Weldonschlamms.

Chem. Ind., 1880, 193; Dingl. pol. J., **237**, 312; Wagner's Jsb., **26**, 324.

Determination of peroxide in "Weldon Mud" and of total acid consumed on solution.

1880: 9. de Koninck, L. L. Bromlösung als Reagens.

Ztschr. anal. Chem., **19**, 468; Jsb. Chem., **1880**, 1153.

Merely refers to the use of bromine for precipitation.

1880: 10. Luckow, C. Ueber die Anwendung des elektrischen Stromes in der analytischen Chemie.

Ztschr. anal. Chem., **19**, 17; Chem. News, **41**, 213; Jsb. Chem., **1880**, 1140.

Electrolytic precipitation.

1880: 11. Lunge, G. Ueber die Zusammensetzung und Analyse des nach Weldon's Verfahren regenerirten Mangansuperoxydes.

Dingl. pol. J., **235**, 300; **236**, 231 and 236; Chem. News, **41**, 141 and 181; Jsb. Chem., **1880**, 1183; J. Chem. Soc. (Lond.), **38**, 528.

Discussion as to the efficiency of the ferrous sulphate-permanganate method for the determination of manganese in "Weldon Mud." See 1880: 14 and 1881: 12.

1880: 12. Parry, J., and Tucker, A. E. The Application of the Spectroscope to the Analysis of Iron and Steel.

J. Iron Steel Inst., **1880**, a, 163.

Detection of manganese.

1880: 13. Pattinson, J. (Discussion.)

Chem. News, **41**, 179; Jsb. Chem., **1880**, 1183.

Precipitation is incomplete by means of chloride of lime except in the presence of ferric chloride. See 1880: 16.

1880: 14. Post, J. Ueber die Zusammensetzung und Analyse des nach Weldon's Verfahren regenerirten Mangansuperoxydes.

Verh. Ver. Beförd. Gewerbfleiss., **58**, 464; Dingl. pol. J., **236**, 225 and 235; Wagner's Jsb., **26**, 317.

Criticism of method used by Lunge, 1880: 11. See also 1881: 12.

1880: 15. Rössler, C. Ueber eine neue maassanalytische Bestimmungsmethode des Mangans und des Kobalts.

Ann. Chem. (Liebig), **200**, 323; Jsb. Chem., **1880**, 1182; Chem. Centrbl., **1880**, 250; Ztschr. anal. Chem., **19**, 75; Chem. News, **41**, 184; Chem. Ztg., **4**, 86; J. Chem. Soc. (Lond.), **38**, 347; Dingl. pol. J., **235**, 391.

Determination with the aid of silver and the Volhard silver titration. See 1879: 12.

1880: 16. WELDON. Volumetric Estimation of Manganese.

Chem. News, **41**, 207; Jsb. Chem., **1880**, 1183.
Precipitation by means of chloride of lime found to be complete. See 1880: 13.

1880: 17. WRIGHT, C. R. A., and MENKE, A. E. Note on Manganese Dioxide.

J. Chem. Soc. (Lond.), **37**, 22; Chem. News, **40**, 261; Jsb. Chem., **1880**, 316; Chem. Centrbl., **1880**, 66; Chem. Ztg., **4**, 86; Ber., **13**, 427.
Composition of manganese peroxide prepared in different ways.

1880: 18. WRIGHT, C. R. A., and MENKE, A. E. Volumetric Determination of Manganese.

J. Chem. Soc. (Lond.), **37**, 42.
Comment on Pattinson's method. See 1879: 9.

1880: 19. VELEY, V. H. On Some Higher Oxides of Manganese and their Hydrates.

Chem. News, **41**, 291; **44**, 241 and 301; J. Chem. Soc. (Lond.), **37**, 581.
A study of the various oxides of manganese.

1880: 20. ZIMMERMANN, C. Zur Scheidung der Schwermetalle der Schwefelammoniumgruppe.

Ann. Chem. (Liebig), **199**, 3 and 9; **200**, 226; Chem. Centrbl. **1880**, 40.
Separation from zinc with the use of ammonium sulphocyanate.

1881: 1. BEILSTEIN, F., and JAWEIN, L. Bestimmung und Trennung einiger Metalle. I. Directe Trennung des Mangans von Eisen.

* Ztschr. rusk. chim. obsc., **13**, 9; Chem. Centrbl.. **1881**, 251; J. Chem. Soc. (Lond.), **42**, 97; Wagner's Jsb., **27**, 358.
Separation from iron by precipitation with iodine from cyanide solution, and also by potassium chlorate in nitric acid solution.

1881: 2. CLASSEN, A. Electrolytische Bestimmungen und Trennungen.

Ber., **14**, 2772; Dingl. pol. J., **242**, 440; Jsb. Chem., **1881**, 1151; Bull. soc. chim. (2), **37**, 525; J. Chem. Soc. (Lond.), **42**, 896; Wagner's Jsb., **28**, 448; Ztschr. anal. Chem., **22**, 417; School Mines Quart., **3**, 302.
Separation from iron, alumina, and phosphoric acid by electrolysis in the presence of oxalates.

1881: 3. Classen, A., and v. Reis, M. Electrolytische Bestimmungen und Trennungen.

Ber., **14**, 1626 and 1630; Dingl. pol. J., **242**, 441; Jsb. Chem., **1881**, 1152; J. Chem. Soc. (Lond.), **40**, 1081; Ztschr. anal. Chem., **21**, 255; Bull. soc. chim. (2), **37**, 184; Wagner's Jsb., **27**, 356; Am. Chem. J., **4**, 58.

Electrolytic separation from iron, and determination by electrolysis.

1881: 4. Delvaux, G. Séparation de l'oxyde de nickel et l'oxyde de cobalt.

C. R., **92**, 723; Jsb. Chem., **1881**, 1188; Ztschr. anal. Chem., **21**, 111.

Separation from cobalt by sulphuretted hydrogen in acetic acid solution, and from nickel by oxidation on standing in the air.

1881: 5. Deshayes, V. Revue métallurgique.

Bull. soc. chim. (2), **36**, 121.

Comments on Ford's and colorimetric methods of determination in steels. See 1881 : 8.

1881: 6. Donath, E. Ueber eine volumetrische Bestimmung von Chrom und Mangan neben Eisenoxyd und Thonerde.

Ber., **14**, 982; Chem. News, **43**, 253; Jsb. Chem., **1881**, 1184; Chem. Centrbl., **1881**, 469; Ztschr. anal. Chem., **22**, 245; Chem. Ztg., **5**, 304; J. Chem. Soc. (Lond.), **40**, 760; Bull. soc. chim. (2), **37**, 92; Wagner's Jsb., **27**, 355; Dingl. pol. J., **242**, 391.

Determination by addition of a neutral solution of manganese to standard solution of permanganate until latter is colorless.

1881: 7. Emmerton, F. A. Chemical Methods for Analysing Rail Steel.

Trans. Am. Inst. Min. Eng., **10**, 203; Jsb. Chem., **1882**, 1289; J. Iron Steel Inst., **1881**, b, 653; Eng. Min. J., **32**, 319; Dingl. pol. J., **246**, 239.

Determination by the Volhard method. (1879: 14.)

1881: 8. Ford, S. A. Method for the Estimation of Manganese in Spiegels, Irons, and Steels.

Trans. Am. Inst. Min. Eng., **9**, 397; Eng. Min. J., **32**, 6.

Precipitation by means of potassium chlorate, re-solution in acid and final precipitation as manganese ammonium phosphate.

1881: 9. Forguignon. Recherches sur la fonte malleable et sur le recuit des aciers.

Ann. chim. phys. (5), **23**, 447.

Determination in steel by the Leclerc method. See 1872: 7.

1881: 10. Iles, M. W. Decomposition of Slags and Silicates.

Chem. News, **43**, 78; J. Chem. Soc. (Lond.), **40**, 645.

Volumetric method of determination through the formation of manganate by fusion with alkali hydroxide. (Unimportant.)

1881: 11. KENT, W. Manganese Determination in Steel.

Trans. Am. Inst. Min. Eng., **10**, 101; J. Iron Steel Inst., **1881**, b, 655; School Mines Quart., **3**, 51.

General discussion of methods. Results of twelve chemists upon the same sample.

1881: 12. LUNGE, G. Zur Orientirung über die Frage des "Weldonschlammes."

Dingl. pol. J., **242**, 371.

Reply to Post, 1880: 14.

1881: 13. LUNGE, G. Bericht an die Generalversammlung des Vereins deutschen Sodafabrikanten.

Chem. Ind., **4**, 373; Dingl. pol. J., **243**, 493; J. Chem. Soc. (Lond.), **42**, 895; J. Soc. Chem. Ind., **1**, 93.

Comments on Fresenius-Will (1843:3), Bunsen (1853:1), and iron methods for the determination of the peroxide.

1881: 14. v. REIS, M. A. Ueber die Benutzung einiger oxalsauren Salze in der Analyse.

Ber., **14**, 1178; Jsb. Chem., **1881**, 1155.

Detection in the presence of phosphoric acid by the aid of oxalates.

1881: 15. SÄRNSTRÖM, C. G. Ueber Manganbestimmung durch Titriren mit Chamäleonlösung.

* Jern.-Kont. Ann., **1881**, Heft 7; Berg- u. hüttenm. Ztg., **40**, 425; Iron, **19**, 104; Jsb. Chem., **1881**, 1188; Ztschr. anal. Chem., **22**, 84; Chem. Ztg., **5**, 895; Chem. News, **47**, 177; Wagner's Jsb., **27**, 358; J. Iron Steel Inst., **1883**, a. 417; Scientif. Am. Suppl., **1882**, 5167.

Precipitation of iron and manganese by sodium bicarbonate, and titration with potassium permanganate in the presence of the precipitate.

1881: 16. TERREIL, A. Liqueur volumétrique pour le dosage des composés suroxygénés ou agissant comme corps oxydants.

Bull. soc. chim. (2), **35**, 551; Chem. Centrbl., **1881**, 569; Jsb. Chem., **1881**, 1155.

Determination of peroxide with the aid of ferrous salts and permanganate.

1881: 17. TROILIUS, M. Chemical Methods for Analysing Rail Steel.

Trans. Am. Inst. Min. Eng., **10**, 173; Eng. Min. J., **32**, 300; J. Iron Steel Inst., **1881**, b, 654; School Mines Quart., **3**, 52.

Separation from iron by the acetate method, precipitation by bromine in ammoniacal solution, and ignition to mangano-manganic oxide.

1881: 18. WILLIAMS, F. A. A Volumetric Estimation of Manganese in Pig Iron and Steel.

Trans. Am. Inst. Min. Eng., **10,** 100; Jsb. Chem., **1882,** 1288; Dingl. pol. J., **246,** 241; J. Iron Steel Inst., **1881,** b, 656; Iron, **18,** 540; Wagner's Jsb., **28,** 15.

Precipitation by means of potassium chlorate, solution in oxalic acid, and titration for the excess of the latter.

1882: 1. DE BOISBAUDRAN, L. Séparation du gallium.

C. R., **94,** 1625; Jsb. Chem., **1882,** 1296; Chem. News, **46,** 3.

Nine methods for the separation from gallium.

1882: 2. CABOT, J. W. Chemical Methods for Analysing Rail Steel.

Trans. Am. Inst. Min. Eng., **10,** 191.

Separation from iron by the acetate method, and precipitation by bromine.

1882: 3. DARTON, N. H. On the Estimation of and Separation of Manganese.

Scientif. Am. Supplem. **1882,** 5168; Chem. Ind., **5,** 201; Wagner's Jsb., **28,** 448; Rep. anal. Chem., **2,** 216; J. Soc. Chem. Ind., **1,** 468.

Determination of peroxide in pyrolusite by solution with potassium oxalate, absorption of carbon dioxide by barium hydroxide, and titration for the excess of the latter.

1882: 4. DEWEY, F. P. Chemical Methods for Analysing Rail Steel.

Trans. Am. Inst. Min. Eng., **10,** 194.

Determination by Kent's method. See 1881: 11.

1882: 5. DIEHL, W. Zur maassanalytische Bestimmung der Hyperoxyde.

Dingl. pol. J., **246,** 196; Chem. Ind., **6,** 157; Ztschr. anal. Chem. (1887), **26,** 296; Jsb. Chem., **1882,** 1290; **1883,** 1567; Chem. Centrbl., **1883,** 6; J. Chem. Soc. (Lond.), **44,** 242; Ber., **16,** 2319; Wagner's Jsb., **29,** 439; Rep. anal. Chem., **3,** 231; J. Soc. Chem. Ind., **3,** 115; Chem.-techn. Rep., **22,** 236.

Determination of peroxide by digestion with hydrochloric acid and potassium iodide, and direct titration with thiosulphate.

1882: 6. DUNN, J. D. Contributions to the History of Oxides of Manganese.

Chem. News, **45,** 137; Jsb. Chem., **1882,** 302.

A study of the oxides of manganese and their relation to the Guyard method. See 1863: 2.

1882: 7. GUYARD, A. Dosage du zinc à l'aide d'un nouveau réactif et séparation de ce métal d'avec les alcalis, la chaux, la magnésie, le manganèse, le cuivre, le nickel et le cobalt.

Monit. scientif. (3), **12,** 778; Jsb. Chem., **1882,** 1293.

Separation from zinc by ammonium sulphocarbonate.

1882: 8. HASWELL, A. E. Maassanalytische Bestimmung und Trennung der Metalle.

Rep. anal. Chem., **2**, 243; J. Iron. Steel Inst., **1882**, 743.
Determination by Volhard method. No details.

1882: 9. JEWETT, J. Influence of Acetic Acid on the Separation of Iron as a Basic Acetate from Manganese, Zinc, Cobalt, and Nickel.

Am. Chem. J., **1**, 251; Ztschr. anal. Chem., **21**, 262.
See title.

1882: 10. KEISER, E. H. The Electrolytic Separation of Manganese in Pig Iron and Steel.

Eng. Min. J., **33**, 131.
See title.

1882: 11. LEDEBUR, A. Eine colorimetrische Manganbestimmung.

Berg- u. hüttenm. Ztg., **41**, 417; Jsb. Chem., **1882**, 1288; Chem. Centrbl., **1882**, 733; Ztschr. anal. Chem., **22**, 607; Ber., **15**, 2926; Wagner's Jsb., **29**, 15; Stahl u. Eisen, **2**, 626; Rep. anal. Chem., **2**, 346; J. Chem. Soc. (Lond.), **44**, 242; J. Soc. Chem. Ind., **2**, 249; Techn.-chem. Jahrb., **5**, 11; Dingl. pol. J., **248**, 215; Chem.-techn. Rep., **21**, b, 211.
Oxidation by lead peroxide to permanganic acid and comparison with solutions of potassium permanganate.

1882: 12. LEFORT, J., and THIEBAULT, P. De l'influence de la gomme arabique dans certaines réactions chimiques.

J. de pharm. (5), **6**, 169; Pharm. J. Trans. (3), **13**, 301; Jsb. Chem., **1882**, 1259.
Influence of gum arabic on the precipitation as sulphide.

1882: 13. LÖWE, J. Ueber den qualitativen Nachweis und quantitativen Bestimmung des Arsens—sowie einiger in geringer Menge in gediegenen Kupfer des Handels vorkommenden Metalle.

Ztschr. anal. Chem., **21**, 516.
Separation in the analysis of commercial copper.

1882: 14. MILLS, E. J., and BECKET, J. H. Researches on Chemical Equivalence.

Phil. Mag. (5), **13**, 170.
Separation from nickel.

1882: 15. TAMM, A. Die üblichsten Eisenanalysen. (*Title from Chem. Centrbl.*)

* Jern.-Kont. Ann., **1882**, 123; Chem. Centrbl., **1882**, 766; Jsb. Chem., **1882**, 1288; Berg- u. hüttenm. Ztg., **41**, 448.
Comparison of methods of determination.

1882: 16. Troilius, M. Bestämning af mangan i jern.

Jern.-Kont. Ann., **1882**, 526; Berg- u. hüttenm. Ztg., **42**, 255; Jsb. Chem., **1883**, 1568 and 1674; Ber., **16**, 1690; Wagner's Jsb., **29**, 19; Rep. anal. Chem., **3**, 189; J. Soc. Chem. Ind., **2**, 428; Dingl. pol. J., **250**, 417.

Precipitation by means of potassium chlorate, solution and separation of iron, re-precipitation by bromine, and weighing as protosesquioxide.

1882: 17. Wagner, A. Ueber das Verhalten von Braunstein und Chlorkalk beim Glühen mit Chromoxyd und kohlensaurem Natron unter Ausschluss der Luft.

Ztschr. anal. Chem., **21**, 493; Chem. News, **45**, 80.

Determination of peroxide from the amount of chromate formed during the heating.

1883: 1. Goetz. Die Bestimmung des Mangans in Eisen.

Dingl. pol. J., **248**, 215.

Colorimetric determination by oxidation to permanganic acid by means of lead peroxide.

1883: 2. Guyard, A. Recherche qualitative du manganèse dans le zinc de commerce, les cendrése de zinc et les calamines,—et recherches du bismuth dans le plomb commercial, au moyen de l'électrolyse.

C. R., **97**, 673; Bull. soc. chim. (2), **40**, 420; Jsb. Chem., **1883**, 1514; Ber., **16**, 2691; Chem. News, **48**, 193; J. Chem. Soc. (Lond.) **46**, 368 and 640; Chem. Ztg., **7**, 1611; Rep. anal. Chem., **3**, 379; Berg- u. hüttenm. Ztg., **42**, 587.

Permanganic acid formed by electrolysis.

1883: 3. Harvey, J. W. C. New Process for the Rapid Volumetric Estimation of Binoxide of Manganese.

Chem. News. **47**, 2; Jsb. Chem., **1883**, 1566; Chem. Centrbl., **1883**, 199; J. Chem. Soc. (Lond.), **44**, 513; Ztschr. anal. Chem., **23**, 60; Ber., **16**, 262; Chem. Ztg., **7**, 141; Chem. Ind., **6**, 82; Chem.-techn. Rep., **22**, 236; Wagner's Jsb., **29**, 437; Dingl. pol. J., **248**, 303.

Determination of peroxide by solution in an excess of stannous chloride, addition of ferric chloride, and titration for the ferrous chloride formed.

1883: 4. Hampe, W. Zwei neue maassanalytische Manganbestimmungsmethoden.

Chem. Ztg., **7**, 1103; Jsb. Chem., **1883**, 1565; Ber., **16**, 2531; Stahl u. Eisen, **3**, 638; Wagner's Jsb., **30**, 141; Berg- u. hüttenm. Ztg., **42**, 536; Ztschr. anal Chem. (1885), **24**, 422; Techn.-chem. Jahrb., **6**, 27.

Precipitation by means of potassium chlorate, solution by ferrous-ammonium sulphate, and titration for the excess of the latter. Evaporation of nitric-acid solution, heating of residue with phosphoric acid, and titration of the phosphate formed with a solution of ferrous sulphate.

1883: 5. HEMPEL, C. W. Zur maassanalytischen Bestimmung der Hyperoxyde.

Dingl. pol. J., **247**, 144.
Criticism of Diehl's article. See 1882: 5.

1883: 6. v. JÜPTNER, H. Das übermangansaure Kali als Titrirflüssigkeit.

Oester. Ztschr. Berg- u. Hüttenw., **31**, 502.
Comments on Volhard method. (1870: 14.)

1883: 7. KERL, B. (Title unknown.)

Dingl. pol. J., **250**, 416.
Confirmation of Särnström method. See 1881: 15.

1883: 8. KNOP, W. Zur Analyse der Silicate.

Ber. königl. Sach. Ges. Wiss. (math.-phys. Classe), **1882**, 35; Ztschr. anal. Chem., **22**, 558.
Determination in silicates. Brief reference only.

1883: 9. MACKINTOSH, B. The Volumetric Determination of Manganese.

Trans. Am. Inst. Min. Eng., **12**, 79; Chem. News, **48**, 176; Am, Chem. J., **5**, 290; Iron, **22**, 464; Jsb. Chem., **1883**, 1569; J. Iron Steel Inst., **1883**, b, 761; J. Chem. Soc. (Lond.). **46**, 220; Ber., **16**, 2939; Berg- u. hüttenm. Ztg., **43**, 302.
Precipitation by potassium chlorate. Williams method. See 1881: 18.

1883: 10. MEINEKE, C. Titrirung des Mangans durch übermangansaures Kali.

Rep. anal. Chem., **3**, 337; Jsb. Chem., **1883**, 1567; Ztschr. anal. Chem. (1885), **24**, 430; Ber., **16**, 3074; Wagner's Jsb., **29**, 437; Berg- u. hüttenm. Ztg., **43**, 23; Chem. Ztg., **7**, 1609.
Separation from iron by zinc oxide, addition of the solution to an excess of permanganate, and titration for the excess with antimonious chloride.

1883: 11. MEINEKE, C. See 1883: 10.

1883: 12. ORLOWSKI, A. Ersetzung des Schwefelwasserstoffs bei dem systematischen Gang der qualitativen chemischen Analyse durch unterschwefligsaures Ammon.

Ztschr. anal. Chem., **22**, 364.
Detection of manganese.

1883: 13. Raimond, E. Nouvelle méthode volumétrique de dosage du manganèse dans les aciers, fontes, ferro-manganèses, etc.

Rev. univers. des mines, 13, 460; * Armengaud. Publ. Ind., 1883, 189; Jsb. Chem., 1883, 1673; Chem. Centrbl., 1884, 156; Chem. News, 48, 23; Chem. Ztg., 8, 344; Wagner's Jsb., 29, 18; J. Iron Steel Inst., 1883, b, 783; Chem.-techn. Rep., 23, a, 236; Rep. anal. Chem., 4, 137; Berg- u. hüttenm. Ztg., 43, 166; J. Chem. Soc. (Lond.), 48, 840; Dingl. pol. J., 250, 416.

Precipitation by means of potassium chlorate, and use of ferrous sulphate.

1883: 14. Särnström, C. G. Ueber volumetrische Manganbestimmung im Eisen.

Berg- u. hüttenm. Ztg., 42, 436; Wagner's Jsb., 29, 19; Dingl. pol. J., 250, 436.

Comments on Schoeffel and Donath method of determination. See 1883: 17.

1883: 15. Särnström, C. G. Tillägg till uppsat sen om manganprof medelst titrering.

Jern.-Kont. Ann., 1883, 400; Stahl u. Eisen, 4, 127; Wagner's Jsb., 30, 23.

See 1881: 15.

1883: 16. Schmitt. Einführung einheitlicher Untersuchungsmethoden bei Manganbestimmungen in Eisen.

Stahl u. Eisen, 3, 487; Wagner's Jsb., 29, 18; Oester. Ztschr. Berg- u. Hüttenw., 32, 164.

Request for the appointment of a commission to propose uniform methods for the determination of manganese.

1883: 17. Schoeffel, R., and Donath, E. Ueber eine neue Methode der volumetrischen Bestimmung des Mangans, insbesondere in Eisen und Stahl.

Oester. Ztschr. Berg- u. Hüttenw., 31, 229; Jsb. Chem., 1883, 1567; Chem. Centrbl., 1883, 332; Dingl. pol. J., 248, 421; Chem. Ztg., 7, 587; Ztschr. anal. Chem. (1885), 24, 427; Ber., 16, 1690; Wagner's Jsb., 29, 15; Stahl. u. Eisen, 3, 374; J. Iron Steel Inst., 1883, a, 381; Rep. anal. Chem., 3, 207; Berg- u. hüttenm. Ztg., 42, 231; Pharm. Runds, 1883, 352; Chem.-techn. Rep., 22, b, 235.

Volumetric determination by the addition of the manganese solution to alkaline permanganate solution.

1883: 18. Schucht. Zur Elektrolyse.

Ztschr. anal. Chem., 22, 493; Jsb. Chem., 1883, 1512; Dingl. pol. J., 254, 298.

Electrolytic precipitation.

1883: 19. STONE, G. C. The Determination of Manganese in Spiegel.

Trans. Am. Inst. Min. Eng., 11, 323; Eng. Min. J., **35**, 318; Iron, **22**, 378; J. Iron Steel Inst., **1883**, a, 366; Dingl. pol. J., **250**, 416; Techn.-chem. Jahrb., **6**, 27.

Precipitation by means of potassium chlorate, solution in oxalic acid, and titration with permanganate. Doubt as to the composition of the precipitate produced by the chlorate.

1883: 20. STONE, G. C. The Volumetric Determination of Manganese.

Chem. News, **48**, 273; Jsb. Chem., **1883**, 1569; J. Chem. Soc. (Lond.), **46**, 499; Wagner's Jsb., **29**, 19.

Reply to Mackintosh. 1883: 9.

1883: 21. TROILIUS, M. The Determination of Manganese in Spiegel, Ferro-manganese, Steel, etc.

Trans. Am. Inst. Min. Eng., **12**, 73; J. Iron Steel Inst., **1883**, b, 761; Iron, **22**, 397; Jern.-Kont. Ann., **1883**, 466; Berg- u. hüttenm. Ztg., **43**, 284; Jsb. Chem., **1884**, 1599; Chem. Centrbl., **1884**, 716; Ber., **17**, 386, Ref.; J. Chem. Soc. (Lond.), **48**, 597; Stahl. u. Eisen, **4**, 126; Wagner's Jsb., **30**, 18; J. Soc. Chem. Ind., **3**, 523; **4**, 137.

Use of potassium bichromate in connection with the Williams method of determination. See 1881: 18.

1883: 22. WOLFF, N. Ueber die Anwendung eines mit Bromdämpfen geschwängerten Luftstromes zur Fällung des Mangans.

Ztschr. anal. Chem., **22**, 520; Jsb. Chem., **1883**, 1566; Chem. Centrbl., **1884**, 156; J. Chem. Soc. (Lond.), **46**, 640; Ber., **16**, 3075; Chem. News, **49**, 201; Wagner's Jsb., **29**, 438; Rep. anal. Chem., **3**, 364; J. Am. Chem. Soc., **5**, 244.

Precipitation by bromine in ammoniacal solution.

1883: 23. ZULKOWSKY, K. Zur Bestimmung des Mangans in Eisenerzen. (*Title from Dingl. pol. J.*)

* Ber. oester. chem. Ges., **1883**, 3; Jsb. Chem., **1883**, 1569; J. Chem. Soc., **46**, 116; Dingl. pol. J., **248**, 259; Wagner's Jsb., **28**, 1; * Chemiker u. Droguist, **1883**, 62; Rep. anal. Chem., **3**, 124; Chem.-techn. Rep., **22**, b, 236.

Precipitation as sulphide, ignition, solution of the residue in sulphurous and nitric acids, and titration with permanganate.

1884: 1. ANGER, C. Prüfung der Mangantitrirung mit Kaliumpermanganat in alkalischer Lösung.

Stahl. u. Eisen, **4**, 156; Wagner's Jsb., **30**, 397; Dingl. pol. J., **254**, 139.

Titration with permanganate in the presence of sodium carbonate in excess.

1884: 2. Atkinson, A. J. Volumetric Estimation of Manganese.

Chem. News, **49**, 25; Jsb. Chem., **1884**, 1599.

Determination in spiegeleisen by difference, after determination of the iron volumetrically. See Holdich, 1884: 8.

1884: 3. Bloxam, C. L. Estimation of Manganese in Cast Iron and Spiegeleisen.

Chem. News, **50**, 112; Jsb. Chem., **1884**, 1599; Chem. Centrbl., **1884**, 849; Ber., **17**, 508, Ref.; Chem. Ztg., **8**, 1436; J. Iron Steel Inst., **1884**, b, 584; J. Chem. Soc., **48**, 84; Wagner's Jsb., **31**, 18; J. Am. Chem. Soc., **6**, 242; Berg- u. hüttenm. Ztg., **43**, 520; Iron, **24**, 271; Chem. Ind., **7**, 362; Chem.-techn. Rep., **23**, b, 186; **24**, 249.

Separation from iron by double acetate precipitation with the addition of phosphates, and final precipitation of manganese as phosphate.

1884: 4. Classen. A. Entgegnung. (Wieland, 1884: 17.)

Ber., **17**, 2351; Jsb. Chem., **1884**, 1540; Ztschr. anal. Chem., **24**, 247.

Electrolytic determination. See also 1885: 4.

1884: 5. Classen, A. Quantitative Analyse durch Elektrolyse.

Ber., **17**, 2472 and 2484; Jsb. Chem., **1884**, 1543; Ztschr. anal. Chem., **24**, 255.

Separation from copper and chromium by electrolysis.

1884: 6. Gmelin, O. Chemische Notizen für der Giesserei-Techniker.

Oester. Ztschr. Berg- u. Hüttenw., **1884**, No. 49; Berg- u. hüttenm. Ztg., **44**, 23, Ref.

A modification of the Volhard method of determination.

1884: 7. Hanowsky. Ueber eine neue Anwendung des Wasserstoffsuperoxyds in der chemischen Analyse. (*Title from Chem. Ztg.*)

* Ber. oester. Ges. z. Förd. Chem. Ind., **1884**, 8; Jsb. Chem., **1884**, 1562; Rep. anal. Chem., **1884**, 220; Chem. Ztg., **8**, 789.

Precipitation by hydrogen peroxide and ignition to mangano-manganic oxide.

1884: 8. Holdich. Volumetric Estimation of Manganese.

Chem. News, **49**, 9 and 57; Jsb. Chem., **1884**, 1598.

Determination in spiegeleisen by difference, after volumetric determination of the iron.

1884: 9. Holthof, C. Ueber Fällung des Mangans mit Brom.

Ztschr. anal. Chem., **23**, 491; Jsb. Chem., **1884**, 1598; Chem. Centrbl., **1885**, 67; Ber., **18**, 34, Ref.; Wagner's Jsb., **30**, 397; Berg- u. hüttenm. Ztg., **44**, 55; J. Soc. Chem. Ind., **4**, 367.

Precipitation by bromine in ammoniacal solution. Comments on Beilstein and Jawein chlorate method. See 1879: 1.

1884: 10. ILES, M. W. Manganese in Slags Formed by Argentiferous Lead Smelting.

School Mines Quart., 1884, 223; Chem. News, 50, 194; Berg- u. hüttenm. Ztg., 44, 16.

Comments on Haswell's method of determination. See 1880: 5.

1884: 11. LEDEBUR, A. Ueber Manganbestimmung im Eisenbetriebe.

Chem. Ztg., 8, 910, 927, and 963; Iron, 24, 558; Jsb. Chem., 1884, 1597; J. Chem. Soc. (Lond.), 44, 242; J. Iron Steel Inst., 1884, a, 269; Berg- u. hüttenm. Ztg., 43, 452; J. Soc. Chem. Ind., 3, 522.

Comments on the Pattinson (1879: 9), Hampe (1883: 4), and Volhard (1879: 14) methods.

1884: 12. MACKINTOSH, J. B. The Influence of Organic Matter and Iron on the Volumetric Determination of Manganese.

Trans. Am. Inst. Min. Eng., 13, 39; Iron, 24, 224; Jsb. Chem., 1884, 1599; Chem. News, 50, 75; J. Chem. Soc. (Lond.), 48, 85; Ber., 18, 126; Chem. Ztg., 8, 1144; Berg- u. hüttenm. Ztg., 43, 302; Bull. soc. chim. (2), 41, 354; Eng. Min. J., 37, 440.

Influence of organic matter on the Williams method of determination (1881: 18).

1884: 13. MACKINTOSH, J. B. Manganese Methods.

School Mines Quart., 6, 35.

Comparison of methods.

1884: 14. MAUMENÉ, E. J. Sur l'existence du manganèse dans les animaux et les plantes et sur son rôle dans la vie animale.

Bull. soc. chim. (2), 41, 451; (2), 42, 305; C. R., 98, 1416; Jsb. Chem., 1884, 1436.

Detection in plants, wines, and cereals by oxidation to permanganic acids. Various procedures briefly mentioned.

1884: 15. MEINEKE, C. Bestimmung des Mangans durch Permanganat. (*Title from Rep. anal. Chem.*)

* Chem. Verst. Mitt., 1884, 63; Rep. anal. Chem., 5, 1; Jsb. Chem. 1884, 1596; Chem. Ztg., 9, 432; Ztschr. anal. Chem., 24, 423; Chem. Ind., 8, 86; Ber., 18, 125, Ref.; J. Am. Chem. Soc., 7, 91; Dingl. pol. J., 257, 202.

Comments on Guyard (1863: 2), Volhard (1879: 14), Morawski and Stingl (1878: 4), and Ledebur (1884: 11) methods of determination.

1884: 16. STONE, G. C. The Determination of Manganese in Spiegel.

Trans. Am. Inst. Min. Eng., 12, 295 and 514; School Mines Quart., 6, 24; J. Iron Steel Inst., 1884, a, 335; Eng. Min. J., 36, 228; 37, 138; Berg- u. hüttenm. Ztg., 42, 442.

Shows variation in results obtained by different chemists when working upon the same sample.

1884: 17. Wieland, J. Ueber elektrolytische Bestimmungen.

Ber., **17**, 1611 and 2931; Jsb. Chem., **1884**, 1542; Chem. News, **50**, 211.

Electrolytic determination. See Classen, 1884: 4.

1884: 18. Wolff, N. Eine maassanalytische Bestimmung des Mangans.

Stahl u. Eisen, **4**, 702; J. Iron Steel Inst., **1885**, a, 301; Wagner's Jsb., **31**, 12; Berg- u. hüttenm. Ztg., **44**, 20; Dingl. pol. J., **257**, 199; Chem.-techn. Rep., **23**, b, 186.

Separation from iron by means of zinc oxide, and titration with permanganate in the presence of the iron precipitate.

1885: 1. Bloxam, C. L. On the Detection of Iron, Aluminium, Chromium, Manganese, Cobalt, Nickel, Calcium, and Magnesiums (as Phosphates) in the Precipitate Produced by Ammonia.

Chem. News, **52**, 109; Chem. Centrbl., **1885**, 942; J. Chem. Soc., **48**, 1264; Chem. Ind., **8**, 324.

Detection by means of phosphates.

1885: 2. Charpentier, P. Sur une nouvelle méthode d'analyse volumétrique, applicable aux essais des bioxydes de manganèse.

C. R., **101**, 316; Chem. Centrbl., **1885**, 715; Jsb. Chem., **1885**, 1937; Chem. News, **52**, 87; J. Iron Steel Inst., **1886**, a, 401; Ztschr. anal. Chem., **28**, 733; J. Chem. Soc. (Lond.), **48**, 1162; Wagner's Jsb., **32**, 345; Rep. anal. Chem., **5**, 352; Dingl. pol. J., **259**, 103; Chem.-techn. Rep., **24**, b, 248; **25**, a, 207; Chem. Ind., **9**, 59.

Determination of peroxide by passage of chlorine evolved on solution in hydrochloric acid into ferrous sulphate solution, and titration for ferric iron with potassium hydroxide in presence of potassium sulphocyanide.

1885: 3. Cheever, B. W. Estimation of Manganese, Carbon, and Phosphorus in Iron and Steel.

Trans. Am. Inst. Min. Eng., **14**, 372; J. Iron Steel Inst., **1885**, 736.

Comments on the Williams method. (1881: 18)

1885: 4. Classen, A. Bemerkungen zu der Antwort des Herrn Wieland.

Ber., **18**, 168.

Determination by electrolysis. See 1884: 4 and 1884: 17.

1885: 5. Classen, A. Quantitative Analyse durch Elektrolyse.

Ber., **18**, 1793; Jsb. Chem., **1885**, 1883; Bull. soc. chim. (2), **45**, 893; Dingl. pol. J., **259**, 93; Ztschr. anal. Chem., **25**, 110.

Electrolytic separation from iron.

1885: 6. Deane, L. M. Ferricyanide of Manganese.

Chem. News, **51**, 164 and 248; Jsb. Chem., **1885**, 1937.

Solubility of manganese ferricyanide. Note on an error in Fresenius' Qualitative Analysis. See 1885: 8.

1885: 7. Diehl, W. Zur Bestimmung des Mangans.

Chem. Ind., **8,** 206; Chem. Centrbl., **1885,** 713; Jsb. Chem., **1885,** 1934; J. Chem. Soc. (Lond.), **50,** 101; Wagner's Jsb., **31,** 89; Rep. anal. Chem., **5,** 300; Dingl. pol. J., **258,** 95; Chem. Ztg., **8,** 1502; Chem.-techn. Rep., **24,** b, 248.

Precipitation by bromine and ammonia, solution in hydrochloric acid and estimation of the iron by the amount of iodine liberated from potassium iodide.

1885: 8. Draper, C. N. Solubility of Manganese Ferricyanide in Hydrochloric Acid.

Chem. News, **51,** 226; Jsb. Chem., **1885,** 1937.

See 1885: 6.

1885: 9. Hampe, W. Ein einfaches Verfahren zur Trennung des Zinks von allen Metallen seiner Gruppe.

Chem. Ztg., **9,** 543; Chem. Centrbl., **1885,** 603; Jsb. Chem., **1885,** 1938; Ztschr. anal. Chem., **24,** 588.

Separation from zinc by precipitation with hydrogen sulphide in presence of formates.

1885: 10. Hampe, W. Die maassanalytische Bestimmung des Mangans in Legirungen, Mineralien u. s. w. mittelst Kaliumchlorats.

Chem. Ztg., **9,** 1083 and 1515; Berg- u. hüttenm. Ztg., **44,** 328; Monit. scientif., **27,** 1046; Chem. Centrbl., **1885,** 714; Jsb. Chem., **1885,** 1936; Ber., **18,** 580, Ref.; J. Iron Steel Inst., **1885,** b, 652; Wagner's Jsb., **31,** 311; Rep. anal. Chem., **5,** 299; Techn.-chem. Jahrb., **8,** 17 and 83; J. Soc. Chem. Ind., **4,** 690; Analyst, **10,** 191.

Precipitation with potassium chlorate, solution of the precipitate, addition of ferrous sulphate, and titration with permanganate. See 1883: 4.

1885: 11. v. Jüptner, H. Eine neue Manganbestimmungsmethode auf gewichtsanalytischem Wege.

Chem. Ztg., **9,** 692; Jsb. Chem., **1885,** 1935; Ztschr. anal. Chem., **25,** 217; J. Iron Steel Inst., **1885,** a, 247; Wagner's Jsb., **31,** 14; J. Soc. Chem. Ind., **4,** 510; Dingl. pol. J., **257,** 201; Analyst, **10,** 149; Chem.-techn. Rep., **24,** 249.

Precipitation as manganous sulphide, after removal of the iron with barium carbonate, solution of the precipitate in acetic acid, evaporation and ignition to mangano-manganic oxide.

1885: 12. Kalmann, W., and Smolka, A. Ueber eine neue Methode zur Bestimmung des Mangans in Spiegeleisen, Ferromangan und den wichtigsten Erzen.

Wien. Acad. Ber. (2 Abt.), **91,** 49; Monatsh., **6,** 65; Chem. Centrbl., **1885,** 235; Jsb. Chem., **1885,** 1936; Ztschr. anal. Chem., **24,** 590;

Chem. News, **51**, 230; J. Chem. Soc. (Lond.), **48**, 690; Ber., **18**, 198, Ref.; Bull. soc. chim. (2), **45**, 356; Wagner's Jsb., **31**, 17; Monit. scientif., **27**, 1205; Oester. Ztschr. Berg- u. Hüttenw., **34**, 130; J. Soc. Chem. Ind., **4**, 419; Dingl. pol. J., **257**, 204; Arch. Pharm., **223**, 314; Iron, **25**, 516; J. Iron Steel Inst., **1885**, 248.

Fusion with sodium carbonate and borax, solution of the fused mass, addition of an excess of ferrous sulphate, and titration for this excess with permanganate.

1885: 13. Lunge, G. Ueber die Analyse von übermangansauren Kali und Braunstein durch Wasserstoffsuperoxyd.

Ber., **18**, 1872; J. Chem. Soc. (Lond.), **48**, 1162; Chem. Ind., **8**, 255; J. Soc. Chem. Ind., **4**, 613; Chem.-techn. Centr. Anz., **1885**, 775; Chem.-techn. Rep., **24**, b, 248.

Addition of the permanganate to an excess of hydrogen peroxide, in the presence of sulphuric acid, and measurement of the evolved oxygen.

1885: 14. Mathesius, W. Eine neue gewichtsanalytische Manganbestimmung.

Chem. Ztg., **8**, 1777; Ber., **1885**, 34, Ref.; Ztschr. anal. Chem., **25**, 116; Chem. News, **52**, 224; **53**, 74; Wagner's Jsb., **31**, 18; Monit. scientif., **27**, 982.

Separation from iron by means of zinc oxide and precipitation by the Wolff method. See 1883: 22.

1885: 15. Meineke, C. Zur Maassanalyse des Mangans.

Chem. Ztg., **9**, 1478 and 1787; Dingl. pol. J., **257**, 202; Rep. anal. Chem., **5**, 389; Berg- u. hüttenm. Ztg., **45**, 35.

Determination by weighing as sulphate, by titration with permanganate and antimony chloride, and by the chlorate method. See 1883: 10.

1885: 16. Osmond. Méthode colorimétrique de dosage du manganèse.

Bull. soc. chim. (2), **43**, 66; Chem. Centrbl., **1885**, 234; Jsb. Chem., **1885**, 1935; J. Iron Steel Inst., **1885**, a, 275; J. Chem. Soc. (Lond.), **48**, 690; Ztschr. anal. Chem., **25**, 552; Ber., **18**, 344, Ref.; Chem. Ind., **8**, 119; Wagner's Jsb., **31**, 15; Dingl. pol. J., **257**, 201; Arch. Pharm., **223**, 285; Chem.-techn. Rep., **24**, 249.

Oxidation by means of lead peroxide in the presence of metaphosphates and nitric acid.

1885: 17. Reinhardt, C. Ueber N. Wolff's gewichtsanalytische Manganbestimmung.

Stahl und Eisen, **5**, 81; Ztschr. anal. Chem., **25**, 114; Wagner's Jsb., **31**, 14; Dingl. pol. J., **257**, 201.

Separation from calcium in the presence of ammonium acetate. See 1883: 22.

1885: 18. REINHARDT, C. Ueber Manganbestimmung.

Stahl und Eisen, **5**, 782; Wagner's Jsb., **32**, 9; Berg.- u. hüttenm. Ztg., **45**, 47; Chem. Ztg., **8**, 15, Ref.; Chem.-techn. Rep., **24**, b, 247.

Discussion of Wolff's gravimetric and volumetric methods. See 1883: 22; 1884: 18, and 1885: 20.

1885: 19. SCHLAGDENHAUFFEN. Ueber die maassanalytische Bestimmung des Mangans. (*Title from Chem. Centrbl.*)

* J. de pharm. (5), **10**, 337; Chem. News, **50**, 249; Chem. Centrbl., **1885**, 146; Jsb. Chem., **1885**, 1936; Chem. Ztg., **8**, 1767; J. Chem. Soc. (Lond.), **48**, 442; J. Iron Steel Inst., **1886**, 1020.

Comments on the Leclerc method and historical discussion of the Lenssen, Guyard, Morawski and Stingl and Rössler methods.

1885: 20. WOLFF, N. Die maassanalytische Bestimmung des Mangans.

Stahl. u. Eisen, **5**, 529; Jsb. Chem., **1885**, 1935; J. Chem. Soc. (Lond.), **48**, 1264; Wagner's Jsb., **31**, 12; Dingl. pol. J., **259**, 199; J. Iron Steel Inst., **1885**, 301.

Titration with permanganate in the presence of ferric oxide.

1886: 1. ATKINSON, R. W. Estimation of Manganese.

J. Soc. Chem. Ind., **5**, 365 and 467; Dingl. pol. J., **262**, 136; Monit. scientif., **28**, 1043; Jsb. Chem., **1886**, 1934; J. Chem. Soc. (Lond.), **52**, 399; Wagner's Jsb., **32**, 4; J. Anal. Chem., **1**, 72.

Gravimetric determination in ores by use of ammonium acetate and bromine; also criticisms of Pattinson's Method. See 1879: 9, and 1886: 20.

1886: 2. BARLOW, J. J. A New Method of Precipitating and Estimating Manganese, also Iron indirectly, by means of Hydrogen Peroxide.

Chem. News, **53**, 41; J. Iron Steel Inst., **1886**, a, 392; Jsb. Chem., **1886**, 1935; J. Chem. Soc. (Lond.), **50**, 393; Ber., **19**, 219, Ref.; Wagner's Jsb., **32**, 4; Chem. Ztg., **10**, 32, Ref.; Berg- u. hüttenm. Ztg., **45**, 350; Dingl. pol. J., **261**, 260; Techn.-chem. Jahrb., **8**, 17; Chem.-techn. Rep., **25**, a, 206.

Separation from zinc, cobalt, nickel, and alkaline-earths, also the simultaneous determination of iron and manganese. The mixed precipitates are ignited, weighed, treated with hydrochloric acid, and the chlorine generated absorbed in potassium iodide.

1886: 3. BEHRENS, T. H. On the Micro-chemical Analysis of Minerals.

Chem. News, **54**, 289.

Detection by micro-chemical tests.

1886: 4. Bein, S. Ueber die quantitative Abscheidung und Bestimmung des Zinks.

Rep. anal. Chem., **1886**, 275; Jsb. Chem., **1886**, 1939.
Separation from iron by the succinate method, and from zinc by treating the ignited oxides with acetic acid.

1886: 5. Blum, L. Ueber die directe Trennung des Mangans von Eisen.

Ztschr. anal. Chem., **25**, 519; Chem. Centrbl., **1887**, 97; Jsb. Chem., **1886**, 1934; Chem. News, **55**, 236; Chem. Ztg., **11**, 251; Ber., **19**, 850, Ref.; J. Chem. Soc. (Lond.), **52**, 183; Chem. Ind., **9**, 383; Wagner's Jsb., **32**, 344; Rep. anal. Chem., **6**, 662; Analyst, **11**, 234; J. Am. Chem. Soc., **9**, 10; Dingl. pol. J., **262**, 335.
Separation from iron by precipitation as ferrocyanide from ammoniacal tartrate solution.

1886: 6. Carnot, A. Séparation successive du cuivre, du cadmium, du zinc et du nickel ou du cobalt (fer et manganèse).

Bull. soc. chim. (2), **46**, 812; C. R., **102**, 621 and 678; Eng. Min. J., **41**, 340; Jsb. Chem., **1886**, 1948; Chem. News, **53**, 196; Ztschr. anal. Chem. (1889), **28**, 344; Chem. Ztg., **11**, 4, Ref.; Ber., **19**, 364, Ref.; J. Chem. Soc. (Lond.), **50**, 650; J. Iron Steel Inst., **1887**, a, 470.
Separation from nickel and iron by means of hydrogen sulphide in acetic acid solution.

1886: 7. Christensen, O. T. Beiträge zur Chemie des Mangans und des Fluors.

J. prakt. Chem., **34**, 41; **35**, 161; Chem. News, **54**, 96; **55**, 153.
Detection by the formation of permanganic acid on the electrolysis of the manganese salt in hydrofluoric acid solution.

1886: 8. Cheever, B. W. Colorimetric Estimation of Manganese in Steel.

Trans. Am. Inst. Min. Eng., **15**, 102; J. Iron Steel Inst., **1885**, b, 736; J. Anal. Chem., **1**, 88.
Criticisms of the method of determination by means of lead peroxide and nitric acid.

1886: 9. Classen, A. See 1884: 4.

1886: 10. Classen, A. See 1884: 5.

1886: 11. Classen, A., and Ludwig, R. Quantitative Analyse durch Elektrolyse.

Ber., **19**, 323; Jsb. Chem., **1886**, 1894.
Separation from mercury by electrolysis.

1886: 12. Deane, L. M. On the Separation of Silica in the Estimation of Manganese in Pig Iron, and On the Estimation of Phosphorus in Pig Iron and Steel.

Chem. News, **54,** 174; Jsb. Chem., **1886,** 1932; Ber., **19,** 851, Ref.; J. Chem. Soc. (Lond.), **52,** 183; Chem.-techn. Centr. Anz., **1887,** 187; Chem.-techn. Rep., **26,** a, 295.

Separation from iron by the basic acetate method, and final separation from silica after igniting and weighing the manganese oxide.

1886: 13. Hunt, A. E. The Estimation of Manganese in Iron and Steel by the Color Method.

Trans. Am. Inst. Min. Eng., **15,** 104; J. Iron Steel Inst., **1886,** b, 1020; J. Anal. Chem., **1,** 89.

Oxidation with lead peroxide in the presence of nitric acid.

1886: 14. Langbein. E. Zur Nickelanalyse.

Rep. anal. Chem., **1886,** 423; Jsb. Chem., **1886,** 1937; Dingl. pol. J., **261,** 495.

Separation from nickel by electrolysis.

1886: 14a. Lösekann, G., and Meyer, T. Eine neue Methode der Zinkbestimmung.

Chem. Ztg., **10,** 729.

Separation from zinc by means of phosphate impracticable.

1886: 15. Meineke, C. Eine Methode schneller Bestimmung des Mangans in Eisensorten mittels Permanganat.

Rep. anal. Chem., **6,** 252; Jsb. Chem., **1886,** 1933; Ber., **19,** 464, Ref.; Chem. Ind., **9,** 194; Stahl u. Eisen, **6,** 444; Wagner's Jsb., **32,** 5; Berg- u. hüttenm. Ztg., **46,** 43; J. Soc. Chem. Ind., **5,** 508; Techn.-chem. Jahrb., **9,** 18; Chem.-techn. Rep., **25,** a, 205.

Use of permanganate method (Meineke) with antimonious chloride. See 1883: 10.

1886: 16. Müller, C. G. Ueber eine schnelle und scharfe Methode zur gewichtsanalytischen Bestimmung des Mangans im Spiegeleisen und Ferromangan.

Stahl u. Eisen, **6,** 98; Wagner's Jsb., **32,** 5; Berg- u. hüttenm. Ztg., **45,** 349; Techn.-chem. Jahrb., **8,** 17; J. Iron Steel Inst., **1886,** 392.

Separation from iron by the basic acetate method, precipitation by bromine, and subsequently as manganous carbonate; or, separation by the acetate method, and re-precipitation with hydrogen peroxide and determination as mangano-manganic oxide.

1886: 17. Müller, C. G. Ueber die neue Meinekesche Manganbestimmung.

Stahl. u. Eisen, **6,** 590; Chem. Ztg., **11,** 216, Rep.; Wagner's Jsb., **32,** 5; Rep. anal, Chem., **6,** 595; Berg- u. hüttenm. Ztg., **45,** 452; J. Iron Steel Inst., **1886,** 1022; Chem.-techn. Rep., **25,** a, 206.

Comments on the Meineke method. (1883: 10.)

1886: 18. Moore, T. Quantitative Chemical Analysis by Electrolysis.

Chem. News, **53**, 209; Jsb. Chem., **1886**, 1895; J. Chem. Soc. (Lond.), **50**, 921; Eng. Min. J., **41**, 371.

Electrolytic deposition and estimation as oxide.

1886: 19. Moore, T. On the Estimation of Nickel in Mattes, Ores, Slags, etc.

Chem. News, **54**, 300; Jsb. Chem., **1886**, 1938; Ztschr. anal. Chem., **26**, 732.

Separation from nickel by electrolysis.

1886: 20. Pattinson, J. The Volumetric Test for Manganese.

J. Soc. Chem. Ind., **5**, 422; Monit. scientif., **28**, 1048; Jsb. Chem., **1886**, 1934.

Reply to the criticisms of Atkinson. See 1886: 1.

1886: 21. Perillou. Dosage rapide du carbon, du phosphore, etc.

Bull. soc. ind. mineral. (2), **13**, 108; Berg- u. hüttenm. Ztg., **45**, 6, and 32; Jsb. Chem., **1886**, 1933; Ber., **1886**, 181, Ref.; Wagner's Jsb., **32**, 11.

Volumetric method; oxidation by lead peroxide, and titration with ferrous sulphate in nitric acid solution.

1886: 22. Reinhardt, C. Gewichtsanalytische Manganbestimmung.

Chem. Ztg., **10**, 323, 357, and 372; Berg- u. hüttenm. Ztg., **45**, 163; J. Soc. Chem. Ind., **5**, 391.

Separation from iron by the basic acetate method, and precipitation by (1) a current of bromine-ammonia, or (2) bromine in hydrochloric acid, and a current of gaseous ammonia.

1886: 23. Reinhardt, C. Ueber Mangantitrationsmethoden nach N. Wolff, E. Belani, Hampe und Meineke.

Stahl. u. Eisen, **6**, 150; Wagner's Jsb., **32**, 9; Berg- u. hüttenm. Ztg., **45**, 192; J. Iron Steel Inst., **1886**, 393.

See 1884: 18; 1883: 4; 1883: 10; 1887: 17.

1886: 24. Schöffel, R., and Donath, E. Ueber die volumetrische Bestimmung des Mangans.

Monatsh. Chem., **7**, 639; Wein. Acad. Ber. (2 Abth.), **94**, 844; Stahl u. Eisen, **7**, 30; Dingl. pol. J., **264**, 34; Berg- u. hüttenm. Ztg., **1887**, 60; Oester. Ztschr. Berg- u. Hüttenw., **35**, 70; Chem. Centrbl., **1887**, 152 and 285; Jsb. Chem., **1887**, 2429; J. Chem. Soc. (Lond.), **52**, 399; Ztg. angew. Chem., **1887**, a, 159; Chem. Ztg., **11**, 111, Rep.; Ber., **20**, 115, Ref.; Bull. soc. chim. (2), **49**, 48; Chem. Ind., **10**, 230 and 279; Wagner's Jsb., **33**, 273; J. Iron Steel Inst., **1887**, a, 468; Techn.-chem. Jahrb., **9**, 18 and 98; Chem.-techn. Rep., **26**, a, 296.

Volumetric method; addition of an excess of permanganate and titration with arsenious acid.

1886: 25. SETTERWALL, A. Om bestämmande i jern och stål m. m. af dels mangan förmedelst titrering.

Jern.-Kont. Ann., **1886**, 427; *Z. O. S. Berg. u. H. V., **25**, 410; Techn.-chem. Jahrb., **9**, 19.

Determination by oxidation with lead peroxide in nitric acid solution, and titration with arsenious oxide.

1886: 26. SPRENGER. Verfahren zur Analyse von Eisen und Stahl.

Berg- u. hüttenm. Ztg., **45**, 462.

Separation from iron by the basic acetate method, from nickel and cobalt by hydrogen sulphide, and precipitation by bromine.

1886: 27. WOLFF, N. Ueber Manganbestimmungen.

Stahl u. Eisen, **6**, 105; Wagner's Jsb., **32**, 11.

Precipitation by bromine. Also volumetric determination by titration in presence of the precipitated iron. See 1883: 22 and 1884: 18.

1886: 28. ZIMMERMANN, R. Zur N. Wolff'schen Mangantitrirung.

Stahl u. Eisen, **6**, 362; Wagner's Jsb., **32**, 11.

See 1884: 18 and 1886: 27.

1887: 1. BABBITT, H. C. Manganese in Iron and Steel.

Am. Chem. J., **9**, 58; Chem. Centrbl., **1887**, 1185; Jsb. Chem., **1887**, 2515; J. Iron Steel Inst., **1887**, b, 369; J. Chem. Soc. (Lond.), **52**, 619; Wagner's Jsb., **34**, 200.

Oxidation to permanganic acid by means of red lead, and titration with standard reducing agents.

1887: 2. BAYLEY, T. On the Separation of Zinc from Nickel and Manganese, and the Estimation of Nickel.

J. Soc. Chem. Ind., **6**, 499; Chem. Centrbl., **1887**, 1183; Chem. Ztg., **11**, 203, Rep.; Ber. **21**, 39, Ref.; J. Chem. Soc. (Lond.), **54**, 388.

Separation from zinc. Precipitation with sodium hydrogen phosphate and ammonia, addition of just enough hydrochloric acid to effect re-solution and precipitation of the zinc with hydrogen sulphide.

1887: 3. BLAIR, A. A. The Methods Employed in the Analysis of Iron Ores.

Chem. News, **56**, 197; Jsb. Chem., **1887**, 2428.

Determination as phosphate.

1887: 4. BRAND, A. Ueber eine Abänderung der titrirmetrischen Manganbestimmung durch Kaliumpermanganat.

Stahl u. Eisen, **9**, 399; Chem. Centrbl., **1887**, 876; Jsb. Chem., **1887**, 2429; Wagner's Jsb., **33**, 271; J. Iron Steel Inst., **1887**, b, 368; Berg- u. hüttenm. Ztg., **47**, 20; Techn.-chem. Jahrb., **10**, 16.

Volumetric determination by means of permanganate. Oxidation of the iron and destruction of organic matter with barium peroxide.

1887: 5. CHEEVER, B. W. Conversion of Manganese to Permanganic Acid.

J. Anal. Chem., **1**, 176.

A study of the action of lead peroxide in nitric acid solution.

1887: 6. CARNOT, A. Sur diverses réactions des vanadates et leur emploi dans l'analyse chimique.

C. R., **104**, 1803; Chem. News, **56**, 16.

Precipitation as vanadate in ammoniacal solution.

1887: 7. DONATH, E., and ZELLER, R. Einige Anwendungen des Wasserstoffsuperoxydes.

Rep. anal. Chem., **7**, 36; Jsb. Chem., **1887**, 2428; Ber., **20**, 118, Ref.; J. Anal. Chem., **1**, 321.

Separation from zinc, nickel, and cobalt by means of hydrogen peroxide.

1887: 8. HAUSHOFER. (Title unknown.)

*Jahrb. f. Min., **1**, 13; J. Chem. Soc. (Lond.), **52**, 300.

Detection by a microscopic study of the crystals formed on cooling a hot, concentrated sulphuric acid solution of the substance.

1887: 9. JOLLES, A. Ueber Kaliumpermanganat und seiner Bedeutung in der analytischen Chemie.

Schlesische Ges. väterl. Cultur. Breslau, **65**, 150; Rep. anal. Chem., **7**, 491; Ztschr. anal. Chem., **28**, 238; Wagner's Jsb., **33**, 272; J. Chem. Soc., (Lond.) (1889), **56**, 798; Chem. Ztg., **11**, 819.

A study of the Volhard Method. (1879: 14).

1887: 10. KLOBB, T. Permanganates ammonio-cobaltiques.

Ann. chim. phys. (6), **12**, 26.

Separation from cobalt by precipitation as sulphide after the formation of cobaltic cyanide by the addition of a solution of hydrocyanic acid.

1887: 11. v. KNORRE, G. Ueber eine neue Methode zur Trennung von Eisen und Mangan.

Stahl u. Eisen, **7**, 178; Chem. Ind., **1887**, 141; Dingl. pol. J., **265**, 420; Techn.-chem. Jahrb., **9**, 18; **10**, 15.

Use of nitroso-β-napthol to separate manganese from iron or copper.

1887: 12. v. KNORRE, G. Ueber die Verwendbarkeit des Nitroso-β-napthols in der quantitativen Analyse.

Ber., **20**, 283; Ztschr. anal. Chem., **28**, 235; Chem. News, **59**, 232; J. Iron Steel Inst., **1887**, a, 470.

Separation from iron and copper.

1887: 13. LAX, E. Beiträge zur Maassanalyse des Mangans. (*Title from Berg- u. hüttenm. Ztg.*)

* Inaugur. Dissert., Berlin; Berg- u. hüttenm. Ztg., **46**, 243; Chem. Centrbl., **1887**, 970; Chem. Ztg., **11**, 514; Oester. Ztschr. Berg- u. Hüttenw., **35**, 427; Ber., **20**, 740, Ref.; Techn.-chem. Jahrb., **10**, 88.

General discussion of the Schöffel and Donath, Kessler, Hampe, Meineke and Pattinson methods. See 1883: 17; 1872: 5; 1883: 4; 1883: 10 and 1879: 9.

1887: 14. MEINEKE, C. Bestimmung des Mangans durch Fällung mittels Quecksilberoxyd und Brom.

Rep. anal. Chem., **7**, 54 and 67; Analyst, **12**, 48 and 72; Chem. Centrbl., **1887**, 554; Jsb. Chem., **1887**, 2429; J. Iron Steel Inst., **1887**, a, 469; Ztschr. angew. Chem., **1887**, 14; Chem. Ztg., **11**, 51, Rep.; Ber., **20**, 151, Ref.; J. Chem. Soc. (Lond.), **52**, 1139; Stahl u. Eisen, **7**, 287; Wagner's Jsb., **33**, 273; Berg- u. hüttenm. Ztg., **46**, 187; Techn.-chem. Jahrb., **9**, 19 and 97.

Volumetric determination. Precipitation with mercuric oxide and bromine water, solution of the precipitated peroxide in an excess of oxalic acid, and titration for this excess with permanganate.

1887: 15. MEINEKE, C. Zur Maassanalyse des Mangans.

Chem. Ztg., **11**, 137; Chem. Centrbl., **1887**, 230; J. Chem. Soc. (Lond.), **52**, 531; Berg- u. hüttenm. Ztg., **46**, 135; J. Soc. Chem. Ind., **6**, 456; Techn.-chem. Jahrb., **10**, 16.

On the cause of the incomplete precipitation obtained by the chlorate method. See also 1885: 10 and 1885: 15.

1887: 16. MORGAN, J. J. Rapid Methods for the Determination of Silicon, Sulphur, and Manganese in Iron and Steel.

* Ind. Rev.; Chem. News, **56**, 82; Chem. Centrbl., **1887**, 1268; Jsb. Chem., **1887**, 2427; Ztschr. chem. Ind., **1887**, b, 246; Chem. Ztg., **11**, 219, Rep.; J. Chem. Soc. (Lond.), **52**, 1140; Wagner's Jsb., **33**, 271; J. Anal. Chem., **1**, 418; Iron, **30**, 312; Techn.-chem. Jahrb., **10**, 16.

Colorimetric method by oxidation with lead peroxide in nitric acid solution. See also Peters, 1876: 5.

1887: 17. REINHARDT, C. Eine weitere Verbesserung der Belanischen Mangantitration.

Stahl u. Eisen, **7**, 709; Wagner's Jsb., **33**, 586; J. Iron Steel Inst., **1887**, b, 367; Techn.-chem. Jahrb., **10**, 16; Berg- u. hüttenm. Ztg., **46**, 451; Chem.-techn. Rep., **26**, b, 317.

Separation from iron by zinc oxide, precipitation by bromine in the presence of zinc oxide, solution in ferrous sulphate, and titration with potassium permanganate.

1887: 18. See 1888: 21.

1887: 19. L'ASSEMBLÉE REP. FAB. RAILS, ETC. Contributions á l'analyse chimique de fer, de l'aciers et de la fonte.

* Technik (Moscow); Monit. scientif. (4), **1**, 241; Jsb. Chem., **1887**, 2427.

Determination by the Deshayes method. See 1878: 2.

1888: 1. CAMPBELL, A. C. Separation of Ferric Iron from Cobalt, Nickel, and Manganese.

J. Anal. Chem., **2**, 291; Ztschr. anal. Chem., **30**, 616; Chem. Ztg., **12**, 250, Rep.; J. Chem. Soc. (Lond.), (1892) **62**, 103.

Separation from iron by precipitation with lead carbonate.

1888: 2. CARNOT, A. Sur l'emploi de l'eau oxygenée pour le dosage des métaux de la famille du fer.

C. R., **107**, 997 and 1150; Bull. soc. chim. (3), **1**, 279; Chem. News, **59**, 15; Jsb. Chem., **1888**, 2552; **1889**, 2395; Chem. Centrbl., **1889**, 143; Chem. Ztg., **13**, 7 and 16, Rep.; Eng. Min. J., **47**, 141; J. Soc. Chem. Ind., **8**, 216; Ztschr. anal. Chem., **29**, 336; Ztschr. angew. Chem., **1888**, 71; Ber., **22**, 111, Ref.; J. Chem. Soc. (Lond)., **56**, 443; J. Iron Steel Inst., **1889**, a, 394.

Precipitation by means of hydrogen peroxide, solution in oxalic acid, and titration with potassium permanganate.

1888: 3. FRIEDMANN, A. Zur Bestimmung des Mangans in Eisen.

Stahl u. Eisen, **8**, 315; Jsb. Chem., **1888**, 2553; Ztschr. angew. Chem., **1888**, 415; Wagner's Jsb., **34**, 196; Techn.-chem. Jahrb., **11**, 19; J. Iron and Steel Inst., **1888**, b, 328.

Decomposition by means of chlorine and final precipitation and determination as sulphide (Rose method, 1860: 5).

1888: 4. GHILIAN, A. Description et controle de la méthode volumétrique de dosage de manganèse.

Rev. univ. des mines (3), **1888**, 270; Berg- u. hüttenm. Ztg., **1888**, 454; Chem. News, **59**, 121; Jsb. Chem., **1889**, 2399; Wagner's Jsb., **34**, 200.

Separation from iron by means of ammonium carbonate, ammonium succinate, or sodium acetate, and titration with permanganate in the presence of an excess of zinc oxide.

1888: 5. de la Harpe, C., and Réverdin, F. Petites notices analytiques.

Bull. soc. chim. (3), **1**, 164; Chem. Centrbl., **1889**, a, 391; Ber., **22**, 355, Ref.; Wagner's Jsb., **35**, 570; J. Anal. Chem., **3**, 321; J. Soc. Chem. Ind., **8**, 307.

Apparatus for the determination of peroxide by the Bunsen method. (1853: 1.)

1888: 6. Iles, M. W. Lead Slags.

Chem. News, **57**, 18; Ztschr. angew. Chem., **1888**, 197.

Determination in lead slags by the Volhard method. (1879: 14.)

1888: 7. Julian, F. A Method for the Determination of Manganese in Steel.

J. Anal. Chem., **2**, 249; Trans. Am. Inst. Min. Eng., **16**, 355; Chem. Centrbl., **1888**, 1400; Ztschr. anal. Chem., **32**, 370; Ztschr. angew. Chem., **1888**, 521; Chem. News, **58**, 209; Chem. Ztg., **12**, 251, Rep.; Wagner's Jsb., **34**, 193; Rev. univ. des mines, **42**, 301; Eng. Min. J., **46**, 413; J. Iron and Steel Inst., **1888**, a, 376; **1889**, a, 394; Berg- u. hüttenm. Ztg., **47**, 348; Oester. Ztschr. Berg- u. Hüttenw., **37**, 156; Techn.-chem. Jahrb., **11**, 79.

Precipitation with chlorate, solution without filtration with the aid of ferrous sulphate or oxalic acid, and titration with permanganate.

1888: 8. Klein, J. Ueber einige neue Reactionen.

Chem. Ztg., **12**, 1321; Berg- u. hüttenm. Ztg., **47**, 425; Arch. Pharm., **227**, 77.

Test for manganese by means of hydrogen peroxide in alkaline solution.

1888: 9. de Koninck, L. L., and Lecrenier, A. Bestimmung des verfügbaren Sauerstoffs in den Hyperoxyden mittels gasförmigen Salzsäure.

Ztschr. angew. Chem., **1888**, 353; Wagner's Jsb., **34**, 515; Eng. Min. J., **47**, 460; Berg- u. hüttenm. Ztg., **1888**, 295; Chem.-techn. Rep., **27**, a, 235.

Volumetric determination of peroxide depending on the evolution of chlorine gas, reaction of the latter with ferrous sulphate, and of the product with potassium iodide in excess.

1888: 10. Meineke, C. Studien über die Analyse von Rohstoffen und Production der Eisenindustrie.

Ztschr. angew. Chem., **1888**, 3, 219 and 252; Chem. Centrbl., **1888**, 422 and 865; Jsb. Chem., **1888**, 2550; Ztschr. anal. Chem., **36**, 700; Chem. Ztg., **12**, 29; Ber., **21**, 311, Ref.; Wagner's Jsb., **34**, 198; Berg. u- hüttenm. Ztg., **47**, 81; J. Chem. Soc. (Lond.), **54**, 1132; **56**, 309; J. Iron Steel Inst., **1888**, b, 326.

Criticism of the various methods of separation from iron. Precipitation as sulphide, as carbonate, and as phosphate; separation from iron by means of nitroso-β-naphthol, barium carbonate, mercuric and zinc oxides, and by the acetate and sulphate methods.

1888: 11. Moore, T. Methods for the Separation of Iron, Nickel, Cobalt, Manganese, Zinc, and Aluminium.

Chem. News, **57**, 125; Chem. Centrbl., **1888**, 644; Jsb. Chem., **1888**, 2553; J. Chem. Soc. (Lond.), **54**, 631; Ber., **21**, 544, Ref.; J. Anal. Chem., **2**, 309.

Separation from iron, nickel, and cobalt, by solution of the mixed carbonate precipitate with potassium cyanide, and precipitation of the manganese from this solution as sulphide, or as hydrated peroxide by means of hydrogen peroxide.

1888: 12. Oettel, F. Ueber die Analyse des Neusilbers.

Ztschr. anal. Chem., **27**, 16; Jsb. Chem., **1888**, 2554.

Separation from iron and cobalt by electrolysis; precipitation by bromine, and determination as mangano-manganic oxide.

1888: 13. Reinhardt, C. Zur Bestimmung des Mangans in siliciumreichen aber manganarmen Roheisensorten.

Ztschr. angew. Chem., **1888**, 108; Chem. Centrbl., **1888**, 500; Jsb. Chem., **1888**, 2553; Ztschr. anal. Chem., **32**, 368; Chem. News, **58**, 171; Chem. Ztg., **12**, 66, Rep.; Chem. Ind., **11**, 186; J. Iron Steel Inst., **1888**, a, 377; b, 330; J. Chem. Soc. (Lond.), **54**, 1132; Wagner's Jsb., **34**, 197; Berg- u. hüttenm. Ztg., **47**, 221; J. Soc. Chem. Ind., **7**, 234; Analyst, **13**, 74.

Precipitation by bromine water in presence of sodium acetate and zinc oxide, re-solution in an excess of an oxalate solution, and titration for this excess with permanganate. Comments on chlorate method.

1888: 14. v. Reis, M. A. Vorschläge zur Einführung von einheitlichen analytischen Methoden für Eisenhüttenlaboratorien.

Stahl. u. Eisen, **8**, 97; Techn.-chem. Jahrb., **10**, 16.

Separation from iron by the acetate method, and determination by precipitation by bromine and ignition to mangano-manganic oxide.

1888: 15. Schneider, L. Eine neue Bestimmungsmethode des Mangans.

Wien. Akad. Ber. (2 b), **97**, 256; Monatsh. Chem., **9**, 242; Dingl. pol. J., **269**, 224; Chem. Ind., **11**, 444; J. Soc. Chem. Ind., **7**, 525 and 693; Chem. Centrbl., **1888**, 949; Jsb. Chem., **1888**, 2552; J. Chem. Soc. (Lond.), **54**, 873; Ztschr. angew. Chem. **1888**, 417; Chem. Ztg., **12**, 129, Rep.; Ber., **21**, 451, Ref.; Wagner's Jsb., **34**, 193; Berg- u. hüttenm. Ztg., **47**, 269; Arch. Pharm., **226**, 658; J. Anal. Chem., **2**, 322; Techn.-chem., Jahrb. **11**, 19; Chem.-techn. Rep., **27**, a, 234.

Determination by oxidation with bismuth tetroxide and titration with hydrogen peroxide.

1888: 16. Schürmann. Ueber die Verwandtschaft der Schwermetalle zum Schwefel.

Ann. Chem. (Liebig), **249,** 329.
Filtration of sulphides aided by a concentrated solution of sodium acetate.

1888: 17. Stein, G. Zur Manganbestimmung in Nahrungs- und Genussmitteln.

Chem. Ztg., **12,** 446; Chem. Centrbl., **1888,** 645; J. Chem. Soc. (Lond.), **56,** 188; Chem.-techn. Rep., **27,** a, 257.
Determination in the ashes of food-stuffs by treatment with sodium nitrate, sulphuric acid, and lead peroxide, and titration for the permanganate formed with a standard ferrous salt solution. See 1888: 20.

1888: 18. Thorpe, T. E., and Hambly, F. J. Note on Chatard's Method for the Estimation of Small Quantities of Manganese.

J. Chem. Soc. (Lond.), **53,** 182; Jsb. Chem., **1888,** 2552; Ztschr. anal. Chem., **32,** 367; Chem. Ztg., **12,** 92, Rep.; Ber., **21,** 374, Ref.; J. Iron Steel Inst., **1888,** b, 329; J. Anal. Chem., **2,** 197; Techn.-chem. Jahrb., **10,** 16; Chem. News, **57,** 48.
Oxidation with lead peroxide, and titration with ammonium oxalate. See 1871: 2.

1888: 19. Thorpe, T. E., and Hambly, F. J. On Manganese Trioxide.

J. Chem. Soc. (Lond.), **53,** 179; Chem. Ztg., **12,** 155.
Description of Chatard's volumetric method. See 1871: 2 and 1888: 18.

1888: 20. Weissmann, G. Kurze Methode der Manganbestimmung im Roheisen, Stahl, etc.

Chem. Ztg., **12,** 205; Chem. Centrbl., **1888,** 423; Ber., **1888,** 311, Ref.; Ztschr. anal. Chem., **32,** 366; Chem. Ind., **11,** 212; Wagner's Jsb., **34,** 198; J. Chem. Soc. (Lond.), **54,** 992; J. Iron and Steel Inst., **1888,** a, 377; **1893,** b, 531; Berg- u. hüttenm. Ztg., **47,** 113; J. Soc. Chem. Ind., **7,** 235; Dingl. pol. J., **267,** 528; Techn.-chem. Jahrb., **10,** 17; Chem.-techn. Rep., **27,** a, 234.
Modification of the Chatard method. Oxidation to permanganic acid by lead peroxide and titration with ferrous ammonium sulphate. See 1871: 2 and 1888: 17.

1888: 21. ——. Analytical Chemistry as Applied to the Manufacture of Iron and Steel.

Iron, **30,** 360 and 504; Stahl und Eisen, **8,** 607; Wagner's Jsb., **35,** 173.
Separation from iron by the acetate method, precipitation by bromine, and determination as mangano-manganic oxide, as manganous sulphate, or by difference after determination of the iron.

1889: 1. Alt, H. Zur Fällung von Mangan als Hyperoxyd.

Chem. Ztg., **13,** 1339; Chem. Centrbl. **1889,** b, 859; Jsb. Chem., **1889,** 2399; J. Chem. Soc. (Lond.), **58,** 419; Stahl u. Eisen, **9,** 961; Berg- u. hüttenm. Ztg. **48,** 429; J. Anal. Chem., **3,** 425; Techn.-chem. Jahrb., **12,** 13.

Adhesion of precipitate to glass said to be prevented by boiling the solution to expel air.

1889: 2. Blum, L. Eine Fehlerquelle bei der Trennung geringer Manganmengen von viel Kalk durch Schwefelammonium.

Ztschr. anal. Chem., **28,** 454; Chem. Centrbl., **1889,** b, 513; J. Chem. Soc. (Lond.), **56,** 1087; Ber., **22,** 706, Ref.; Chem. Ind., **13,** 89; Stahl u. Eisen, **9,** 960; School Mines Quart., **11,** 69; J. Iron Steel Inst., **1890,** a, 372; J. Soc. Chem. Ind., **8,** 922; Analyst, **14,** 192.

Separation from calcium by means of ammonium sulphide.

1889: 3. Brand, A. Ueber die Anwendung von pyrophosphorsauren Doppelsalzen zur Bestimmung und Trennung von Metallen durch Electrolyse.

Ztschr. anal. Chem., **28,** 586, 599, and 604; Chem. Centrbl., **1890,** a, 140; Chem. Ind., **13,** 90; J. Chem. Soc. (Lond.), **58,** 294.

Electrolytic determination, and separation from nickel, cobalt, copper, cadmium, zinc, mercury, and iron.

1889: 4. Finkener. Zur Bestimmung des wirksamen Sauerstoffs.

Mitthl. Vers. Berlin, **1889,** 158; Jsb. Chem., **1890,** 2444; Dingl. pol. J., **276,** 479; Ztschr. angew. Chem., **1890,** 271.

Comments on Bunsen, ferrous sulphate, and oxalic acid (volumetric) methods, for the determination of peroxide.

1889: 5. Friedburg, L. H. Notes on Quantitative Analysis.

Chem. News, **62,** 23; Jsb. Chem., **1890,** 2379.

Determination in silicates.

1889: 5a. Gooch, F. A. and Whitfield, J. E. Analyses of Waters of the Yellowstone National Park.

Bull. U. S. Geol. Surv., **No. 47,** 27.

Determination in mineral waters.

1889: 6. Klein, J. Ueber die Empfindlichkeit des Manganachweises mittels Wasserstoffsuperoxyd.

Arch. Pharm. (3), **27,** 77; Chem. Centrbl., **1889,** a, 391; Jsb. Chem., **1889,** 2398; Chem. Ztg., **13,** 83, Rep.; Ber., **22,** 171, Ref.; J. Chem. Soc., **56,** 653; Berg- u. hüttenm. Ztg., **48,** 164; Chem.-techn. Rep., **28,** a, 240.

Detection, in presence of cobalt, by means of hydrogen peroxide.

1889: 7. Kohn, C. J., and Woodgate, J. The Application of Electrolysis to Quantitative Analysis.

J. Soc. Chem. Ind., **8**, 256; Chem. Centrbl., **1889**, b, 54; Jsb. Chem., **1889**, 2304.

Electrolytic separation from iron.

1889: 8. de Koninck, L. L. Zur Prüfung der Reagentien.

Ztschr. angew. Chem., **1889**, 4; Jsb. Chem., **1889**, 2299; Rev. univers. des mines, **1889**, 308; Berg- u. hüttenm. Ztg., **48**, 183; Chem. News, **59**, 230.

Detection of manganese in lead peroxide by decomposition with hot, concentrated sulphuric acid, and the addition of more lead peroxide to form permanganic acid.

1889: 9. Mayer, F. Zur qualitative Analyse des Schwefelammoniumniederschlags.

Ber., **22**, 2627; Jsb. Chem., **1889**, 2391.

Separation from iron and aluminum by the acetate method.

1889: 10. M'Kellar, W. G. A Convenient Solution for Use in Titrating Weldon Muds for Manganese Peroxide.

J. Soc. Chem. Ind., **8**, 968; Jsb. Chem., **1889**, 2399; J. Chem. Soc. (Lond.), **58**, 548.

Determination of peroxides by use of standard solutions of bichromate and ferrous sulphate.

1889: 11. McCulloch, N. The Volumetric Estimation of Cobalt in Presence of Nickel, Manganese, and other Metals.

Chem. News, **59**, 51; Chem.-techn. Rep., **29**, 240; Chem. Ztg., **13**, 38, Rep.

Separation from cobalt by the use of sodium acetate and potassium cyanide.

1889: 12. McCulloch, N. The Use of Peroxide of Hydrogen for the Determination of the Metals of the Iron Group.

Chem. News, **59**, 35; Jsb. Chem., **1889**, 2395; Chem. Ztg., **13**, 26, Rep.

Criticism of Carnot's article on the action of hydrogen peroxide on the salts of manganese.

1889: 13. Moldenhauer, F. Kupfervitriol als Indikator beim Titriren von Zink und Manganese.

Chem. Ztg., **13**, 1220; Chem. Centrbl., **1889**, 811; Jsb. Chem., **1889**, 2407; Ztschr. anal. Chem., **30**, 340; Ber., **22**, 711, Ref.; J. Soc. Chem. Ind., **9**, 108; J. Anal. Chem., **3**, 429.

Volumetric determination in presence of zinc, by the use of ferrocyanide.

1889: 14. NEUMANN, G. Quantitative Bestimmung von Zink neben Mangan.

Ztschr. anal. Chem., **28,** 57; Jsb. Chem., **1889,** 2408; J. Chem. Soc. (Lond.), **56,** 549; J. Soc. Chem. Ind., **8,** 62; J. Anal. Chem., **4,** 69; Chem. Ztg., **23,** 38, Rep.

Separation of zinc as sulphide from a formic acid solution.

1889: 15. RADAU, C. Zur Kenntniss vanadinsaurer Salze.

Ann. Chem. (Liebig), **251,** 154.

Separation from vanadium by fusion with sodium carbonate, solution of the fused mass in water, precipitation of hydrated manganese peroxide with alcohol, re-solution in hydrochloric acid, and re-precipitation with hydrogen peroxide and ammonia.

1889: 16. REITMAIR, O. Kalkbestimmung bei Gegenwart von Phosphorsäure, Eisen, Thonerde und Mangan.

Ztschr. angew. Chem., **1889,** 358; Ztschr. anal. Chem., **31,** 314.

Separation from calcium by means of oxalates.

1889: 17. SCHNEIDER, L. Eine neue Bestimmungsmethode des Mangans.

Oester. Ztschr. Berg- u. Hüttenw., **36,** 608; Chem. Centrbl., **1889,** a, 64; Berg- u. hüttenm. Ztg., **48,** 153; Chem.-techn. Centrl. Anz., **1889,** 64; Pharm. Centrh., **30,** 189; Chem.-techn. Rep. **28,** a, 240.

Oxidation by bismuth tetroxide and titration with hydrogen peroxide

1889: 18. SMITH, E. F. and FRÄNKEL, L. K. Electrolytic Separations.

Chem. News, **60,** 102 and 262; Jsb. Chem., **1889,** 2305; Chem. Ztg., **13,** 257, Rep.; J. Anal. Chem., **3,** 386.

Electrolytic determination in the presence of potassium sulphocyanate.

1889: 19. WELLS, J. S. C. and VULTÉ, H. T. A Scheme for the Separation of Al, Cr, Fe, Co, Ni, Mn, Zn, Ba, Ca, Sr, and Mg, in the Presence of Phosphoric, Arsenic, Oxalic, Boric, Silicic, Hydrofluoric, Acetic, and Tartaric Acids, and Organic Matter.

School Mines Quart., **10,** 3; Analyst, **14,** 188; Ztschr. angew. Chem., **1889,** 681.

Qualitative separation from zinc as sulphide, and detection in the mixed sulphides by fusion with sodium carbonate.

1890: 1. BAUMANN, A. Die Analyse des Braunsteins mittels Wasserstoffsuperoxyd.

Ztschr. angew. Chem., **1890,** 72; Jsb. Chem., **1890,** 2442; Chem. News, **63,** 72; Monit. scientif., **35,** 596.

Comments on the Lunge method and also on the Fresenius–Will method. Determination of peroxide by volumetric and gasometric methods. See 1885: 13; 1890: 9; 1890: 10; and 1843: 3.

1890: 2. VAN BEMMELN, J. M. Ueber die Bestimmung des Wassers, des Humus, des Schwefels, des in colloidalen Silicaten gebundenen Kieselsäure, des Mangans, u. s. w. im Ackerboden.

Landw. Vers. Stat., **37**, 289; Jsb. Chem., **1890**, 2557; J. Chem. Soc. (Lond.), **58**, 833.
Determination in soils. Carnot method. See 1888: 2.

1890: 3. BOYD, R. C. The Determination of Manganese and Zinc as Pyrophosphates.

School Mines Quart., **11**, 355; Jsb. Chem., **1890**, 2442; J. Soc. Chem. Ind., **9**, 973.
See title.

1890: 4. CARNOT, A. (Discussion.)

Bull. soc. chim. (3), **3**, 594; Chem. Ztg., **14**, 637; Oester. Ztschr. Berg- u. Hüttenw., **38**, 450.
Precipitation by means of hydrogen peroxide.

1890: 5. FRESENIUS, R. and HINTZ, E. Ueber die Analyse von Chromeisen.

Ztschr. anal. Chem., **29**, 28; Jsb. Chem., **1890**, 2440.
Determination in chromite.

1890: 6. HELLMAN, C. G. Determination of Manganese in Iron.

Eng. Min. J., **50**, 593.
Recommends method of Särnström. See 1881: 15.

1890: 7. JENSCH, E. Zur Bestimmung des Zinks in manganhaltigem Flugstaube.

Chem. Ztg., **13**, 465, 726; J. Chem. Soc. (Lond.), **58**, 294.
Separation from zinc by means of hydrogen peroxide.

1890: 8. DE KONINCK, L. L. Études sur les procédés d'analyse des matières premières et des produits de la sidérurgie.

Rev. univers. des mines, **9**, 243; Jsb. Chem., **1890**, 2436; Chem. News, **62**, 19; J. Anal. Chem., **4**, 335.
Separation from iron by means of nitroso-β naphthol.

1890: 9. LUNGE, G. Ueber die Werthbestimmung des Chorkalks, Braunsteins und Chamäleons auf gasvolumetrischem Wege (mittels des Nitrometers).

Ztschr. angew. Chem., **1890**, 10; J. Soc. Chem. Ind., **9**, 21; Jsb. Chem., **1890**, 2389; Chem. Ind., **13**, 88; Ztschr. anal. Chem., **30**, 221; Wagner's Jsb., **36**, 560; J. Chem. Soc. (Lond.), **58**, 1470.
Determination of peroxide by means of hydrogen peroxide.

1890: 10. LUNGE, G. Zur gasvolumetrischen Analyse durch Wasserstoffsuperoxyd.

Ztschr. angew. Chem., **1890**, 136; Jsb. Chem., **1890**, 2444.
Reply to Baumann's criticisms. See 1890: 1.

1890: 11. Lunge, G. Das Gasvolumeter, ein Apparat zur volligen Ersparung aller Reductionrechnungen bri Ablesungen von Gasvolumen.

Ztschr. angew. Chem., **1890**, 139; Ber., **23**, 440; Ztschr. anal. Chem., **29**, 589.

A modification of the nitrometer. (See 1890: 9.)

1890: 12. McKenna, A. G. The Precipitation of Manganese as Ammonium Manganous Phosphate.

Tech. Quart., **3**, 333; Chem. News, **63**, 184; J. Anal. Chem., **5**, 140; Iron, **37**, 469; Jsb. Chem., **1891**, 2479; J. Chem. Soc. (Lond.) **61**, 1138; J. Iron Steel Inst., **1891**, b, 326; School Mines Quart., **12**, 262; Berg- u. hüttenm. Ztg., **50**, 186; Eng. Min. J., **51**, 635; J. Soc. Chem. Ind., **10**, 387; Chem.-techn. Rep., **31**, c, 268.

A study of Gibbs method (1867: 3). Comments on Blair method. (1887: 3.)

1890: 13. Myhlertz, F. G. Method for the Rapid Determination of Manganese in Slags, Ores, etc.

J. Anal. Chem., **4**, 267; Chem. Centrbl., **1890**, b, 607; Ztschr. anal. Chem., **32**, 368; Chem. Ztg., **14**, 251, Rep.; Wagner's Jsb., **36**, 337; J. Chem. Soc. (Lond.), **60**, 366; School Mines Quart., **12**, 61; Berg- u. hüttenm. Ztg., **49**, 400; Oester. Ztschr. Berg- u. Hüttenw., **39**, 13; J. Iron Steel Inst., **1891**, a, 444; Techn.-chem. Jahrb., **13**, 75.

Fusion with carbonate and nitrate, reduction of manganate with alcohol, solution of precipitate in ferrous sulphate solution, and titration of excess of latter.

1890: 14. Riban, J. Sur le dosage et la séparation du zinc en présence du fer et du manganèse.

C. R., **110**, 1196; Bull. soc. chim. (3), **4**, 116; Jsb. Chem., **1890**, 2449; Chem. Centrbl., **1890**, b, 120.

Separation from zinc by precipitation with sulphuretted hydrogen in feebly acid solution.

1890: 15. Sellik, B. Technische Analyse des Wolframits.

Chem. Ztg., **13**, 1474; Ztschr. anal. Chem., **29**, 105.

Determination in wolframite.

1890: 16. Vortmann, G. Eine neue Methode zur maassanalytische Bestimmung des Mangans.

Ber., **23**, 2801; Jsb. Chem., **1890**, 2441; Chem. Centrbl., **1890**, b, 676; Ztschr. angew. Chem., **1890**, 715; Chem. Ztg., **14**, 289, Rep.; J. Chem. Soc. (Lond.), **58**, 1470; Chem. News, **62**, 251; Bull. soc. chim. (3), **4**, 854; Chem. Ind., **14**, 214; Wagner's Jsb., **36**, 336; J. Iron Steel Inst., **1891**, a, 440; School Mines Quart., **12**, 61; Oester. Ztschr. Berg- u. Hüttenw., **39**, 14; J. Soc. Chem. Ind., **9**, 1067; J. Anal. Chem., **4**, 57; Chem.-techn. Rep., **30**, b, 179.

Precipitation, after the addition of ferric salt, by means of sodium hydroxide and a standard iodine solution; filtration, and determination of the iodine in a measured volume of the filtrate.

1890: 17. Warren, H. N. A Brief Summary of Practical Manipulation.

Chem. News, **61**, 63; Ztschr. anal. Chem., **30**, 35; Jsb. Chem., **1890**, 2372.
Use of powdered glass to promote settling of the basic ferric-acetate precipitate.

1890: 18. Ziegler, A. Ueber die analytische Bestimmung der wesentlichen Bestandtheile des metallischen Wolframs, Ferro-Wolframs und Wolframstahles; sowie des Ferrochroms und Chromstahles, unter theilweiser Zugrundelegung neuer Aufschlussverfahren.

Dingl. pol. J., **274**, 517; **275**, 91; Monit. scientif. (4), **4**, 486; Jsb. Chem., **1890**, 2455; Ztschr. anal. Chem., **30**, 47.
Determination in tungsten alloys.

1891: 1. Behrens, H. Beiträge zur michrochemischen Analyse.

Ztschr. anal. Chem., **30**, 140.
Detection by microchemical tests with oxalic acid, salt of phosphorus, and potassium chlorate.

1891: 2. Blum, L. Zur Bestimmung des Mangans im Eisen und Stahl.

Ztschr. anal. Chem., **30**, 210; Jsb. Chem., **1891**, 2482; Chem. Centrbl., **1891**, a, 810; J. Chem. Soc. (Lond.), **61**, 963; Chem. Ind., **14**, 498; Berg- u. hüttenm. Ztg., **50**, 211; School Mines Quart., **12**, 335; Chem. News, **63**, 204.
Comments on the Volhard method and the Rürup modification of the same (1891: 26).

1891: 3. Blum, L. Ueber eine neue Methode zur volumetrischen Bestimmung des Mangans.

Ztschr. anal. Chem., **30**, 284; Jsb. Chem., **1891**, 2480; J. Chem. Soc. (Lond.), **61**, 1293; J. Iron Steel Inst., **1891**, b, 330; Chem. Ztg., **15**, 207, Rep.; Ber., **24**, 841, Ref.; Techn.-chem. Jahrb., **14**, 34; School Mines Quart., **12**, 335; Berg- u. hüttenm. Ztg., **50**, 276; **51**, 41; Eng. Min. J., **53**, 88; J. Soc. Chem. Ind., **10**, 798; Analyst, **16**, 140; Chem.-techn. Rep., **31**, c, 267.
Titration with potassium ferrocyanide in the presence of ammonium tartrate, ferric salts, ammonium chloride, and free ammonia.

1891: 4. BROWN, D. H. Hints for Beginners in Iron Analysis.

J. Anal. Chem., **5**, 368 and 374.
Comments on the Volhard (1879: 14) and Williams (1881: 18) methods of determination.

1891: 5. CHEMIKER COMMISSION DER VEREIN DEUTSCHER EISENHÜTTENLEUTE. Manganbestimmung: Bericht über die bisherigen Arbeiten der vom Verein deutscher Eisenhüttenleute eingesetzten Commission zur Einführung einheitlicher Untersuchungsmethoden.

Stahl u. Eisen, **11**, 373; Chem. Centrbl., **1891**, a, 1003; J. Iron Steel Inst., **1891**, a, 437.
Discussion of permanganate and chlorate methods. (Wolff, Hampe, Meineke, Reinhardt, Schoeffel and Donath, Ukena.)

1891: 6. DONATH, E. Zur analytischen Anwendung von Baryum- und Wasserstoffsuperoxyd.

Chem. Ztg., **15**, 1085; Jsb. Chem., **1891**, 2393; Chem. Ind., **15**, 189.
Precipitation by means of hydrogen peroxide. Question of priority. See 1891: 11.

1891: 7. DONATH, E. Ueber eine "neue" Mangan und Zinktrennung von P. Jannasch und MacGregory.

Ber., **24**, 3600; Jsb. Chem., **1891**, 2484; J. Chem. Soc. (Lond.), **62**, 384; Bull. soc. chim. (3), **8**, 524.
Question of priority. See 1891: 11.

1891: 8. HAMPE, W. Zur volumetrischen Bestimmung des Mangans.

Chem. Ztg., **15**, 281.
Criticism of Moore's statements (1891: 18) regarding the conversion of manganese to phosphate and titration with a ferrous salt.

1891: 9. HAMPE, W. Ueber Bestimmung des Mangans nach der Chloratmethode.

Chem. Ztg., **15**, 1579; Jsb. Chem., **1891**, 2481; Chem. Centrbl., **1892**, a, 182; J. Chem. Soc. (Lond.), **62**, 1132.
Criticises report of the Chemiker-Commission, 1891: 5.

1891: 10. JANNASCH, P. and FRANZEK, C. J. Ueber eine neue quantitative Trennung von Mangan und Nickel, Mangan und Kobalt, und von Mangan, Nickel und Kobalt.

Ber., **24**, 3204; Jsb. Chem., **1891**, 2484; Chem. Centrbl., **1892**, a, 182; J. Iron Steel Inst., **1892**, a, 493; Chem. News., **64**, 294; Chem. Ztg., **15**, 306, Rep.; Bull. soc. chim. (3), **8**, 277; J. Chem. Soc. (Lond.), **62**, 240; Chem. Ind., **15**, 213; School Mines Quart., **13**, 177; J. Soc. Chem. Ind., **10**, 1037; Analyst, **17**, 58; Chem.-techn. Rep., **31**, b. 297.
Separations as in title by means of hydrogen peroxide in cyanide solution.

1891: 11. Jannasch, P., and MacGregory, J. F. Ueber eine neue quantitative Trennung von Mangan und Zink.

J. prakt. chem. (2), **43**, 402; Chem. Centrbl., **1891**, a, 1002; J. Chem. Soc. (Lond.), **61**, 963; Chem. News, **63**, 255; **64**, 182; Ztschr. anal. chem., **31**, 69; Chem. Ztg., **15**, 142, Rep.; Ber. **24**, 675, Ref.; School Mines Quart., **12**, 337; **13**, 75; Eng. Min. J., **52**, 386; J. Soc. Chem. Ind., **10**, 659; J. Anal. Chem., **5**, 659.

Separation by means of hydrogen peroxide.

1891: 12. Jannasch, P., and Niederhofheim. Ueber quantitative Metall-scheïdungen in alkalischer Lösung durch Wasserstoffsuperoxyd.

Ber., **24**, 3945; Jsb. Chem., **1891**, 2484; Chem. News, **65**, 159; Ztschr. angew. Chem., **1892**, 83; Chem. Ztg., **16**, 13, Rep.; Chem. Ind., **15**, 213; Iron, **39**, 337.

Separation from zinc by the use of hydrogen peroxide in eyanide solution.

1891: 13. Luckow, C. Verfahren zur leichten electrolytischen Ausfällung verschiedenen Metalle aus sauren Lösungen.

Chem. Ztg., **15**, 740; Jsb. Chem., **1891**, 2402.

Electrolytic precipitation upon mercury with formation of an amalgam.

1891: 14. Luckow, C. Ueber maassanalytische Bestimmungs- und analytische Trennungsmethoden mit Ferro- und Ferricyankalium.

Chem. Ztg., **15**, 1491; Chem. Centrbl., **1892**, a, 180.

Volumetrie determination by means of potassium ferrocyanide.

1891: 15. Le Roy, G. A. Sur un nouveau mode de séparation du fer d'avec le cobalt et le nickel.

C. R., **112**, 722; Ber., **24**, 406, Ref.

Electrolytic precipitation.

1891: 16. Moldenhauer, F. Abänderung der Manganprobe nach Volhard.

Chem. Ztg., **15**, 13; Jsb. Chem., **1891**, 2481; Chem. Centrbl., **1891**, a, 283; Stahl u. Eisen, **11**, 151; Berg. u. hüttenm. Ztg., **50**, 75; Chem.-techn. Rep., **31**, c, 268.

Modification consists of adding ammonium sulphate, and titrating in the presence of the iron precipitate.

1891: 17. Moldenhauer, F. Ueber Fehlerquellen beim Titriren des Zinks mit Ferrocyankalium und deren Vermeidung.

Chem. Ztg., **15**, 223; Ztschr. anal. chem., **30**, 340.

Volumetric determination by means of potassium ferrocyanide.

1891: 18. MOORE, T. Volumetric Estimation of Manganese.

Chem. News, **63**, 66; Eng. Min. J., **51**, 234; Jsb. Chem., **1891**, 2479; Chem. Centrbl., **1891**, a, 554; J.Chem. Soc. (Lond.), **61**, 962; Ztschr. angew. Chem., **1891**, 523; Chem. Ztg., **15**, 33, Rep.; Ber., **24**, 407, Ref.; Bull. soc. chim. (3), **6**, 621; Chem. Ind., **14**, 498; Wagner's Jsb., **37**, 209; Berg- u. hüttenm. Ztg., **50**, 185; J. Anal. chem., **5**, 237; Chem.-techn. Rep., **31**, a, 267.

Volumetric determination by forming manganic metaphosphate, and titrating directly for this compound, with a reducing agent.

1891: 19. NORRIS, G. L. Determination of Manganese in Manganiferous Slags and Ores.

J. Anal. Chem., **5**, 430; Chem. News, **64**, 242; Jsb. Chem., **1891**, 2482; Chem. Centrbl., **1892**, a, 181; Chem. Ztg., **15**, 271, Rep.; Bull. soc. chim. (3), **8**, 539; Ztschr. angew. Chem., **1891**, 650; J. Iron Steel Inst., **1891**, b, 330; J. Chem. Soc. (Lond.), **62**, 385; Wagner's Jsb., **37**, 209; Berg- u. hüttenm, Ztg., **51**, 41; Iron, **38**, 449; Chem.-techn. Rep., **31**, b. 297; Deutsche chem. Ztg., **1891**, 409.

Solution in nitric and hydrofluoric acids, precipitation by potassium chlorate, re-solution of precipitate in oxalic acid or ferrous sulphate solution, and titration for the excess of the reducing agent.

1891: 20. NAMIAS, R. Methode zur schnellen Ausführung von Schlacken-Analysen.

Stahl u. Eisen, **11**, 579; Jsb. Chem., **1891**, 2461; Chem. Centrbl., **1891**, b, 493.

Use of Volhard method of determination (1879: 14).

1891: 21. PATTINSON, J. and H. S. On the Determination of Manganese in its Ores and Alloys.

J. Soc. Chem. Ind., **10**, 333; Jsb. Chem., **1891**, 2483; Chem. Centrbl., **1891**, a, 1091; J. Chem. Soc. (Lond.), **62**, 536; Ztschr. angew. Chem., **1891**, 380; Chem. Ind., **14**, 498; Wagner's Jsb., **37**, 140; School Mines Quart., **12**, 335.

Gravimetric and volumetric methods. A study of the ignition of maganese carbonate and of the hydrated peroxide, with reference to gravimetric determinations. Comments on volumetric methods in use at present and a modified form of the Pattinson method. See 1879: 9.

1891: 22. REGELSBERGER, F. Zur Werthbestimmung des Aluminiums und seiner Legirungen.

Ztschr. angew. Chem., **1891**, 476.

Determination in commercial aluminum.

1891: 23. v. Reis, M. A. Ueber Bestimmung von Mangan nach der Chloratmethode.

Chem. Ztg., **15**, 1791; Chem. Centrbl., **1892**, a, 412; Stahl u. Eisen, **1891**, 375; Ztschr. angew. Chem., **1891**, 377; J. Iron Steel Inst., **1892**, a, 490.

Criticism of Hampe's method of determination by means of potassium chlorate (1883: 4).

1891: 24. Rossi, A. J. On Some Methods of Analysis of Iron, Steel, and Cast Iron as Practised in Large Industrial Works.

Iron Age, **47**, 528; J. Iron Steel Inst., **1891**, a, 443; **1892**, a, 491; Stahl u. Eisen, **11**, 927; Wagner's Jsb., **37**, 147.

Colorimetric determination with the use of sodium metaphosphate.

1891: 25. Rubricius, H. Zur Bestimmung von Mangan in Eisen und Stahl.

Chem. Ztg., **15**, 882; Jsb. Chem., **1891**, 2481; Chem. Centrbl., **1891**, b, 281; J. Chem. Soc. (Lond.), **62**, 1030; Wagner's Jsb., **37**, 146; Chem.-techn. Rep., **31**, b, 297; Berg- u. hüttenm. Ztg., **50**, 390; Analyst, **16**, 180.

Modification of the Volhard method. Comments on Rürup procedure. See 1879: 14 and 1891: 26.

1891: 26. Rürup, L. Manganbestimmung in Eisen und Stahl.

Chem. Ztg., **15**, 149 and 186; Jsb. Chem., **1891**, 2481; Chem. Centrbl., **1891**, a, 470; J. Chem. Soc. (Lond.), **62**, 916; Ztschr. anal. Chem., **30**, 242; Wagner's Jsb., **37**, 140; J. Iron Steel Inst., **1891**, b, 326.

Modification of Volhard procedure. Addition of sodium sulphate, and titration without filtration. See 1891: 25.

1891: 27. Smith, E. F. The Electrolysis of Metallic Phosphates in Acid Solution.

Am. Chem. J., **13**, 206; Jsb. Chem., **1891**, 2400.

Electrolytic separation from cadmium.

1891: 28. Ukena. Modificierte Chloratmethode.

Stahl u. Eisen, **11**, 381.

Precipitation by means of potassium chlorate and solution in reducing agent.

1892: 1. Aller. Quick Assay Methods.

Iron, **40**, 382; Berg- u. hüttenm. Ztg., **52**, 106; Chem. Centrbl., **1893**, a, 858.

Determination by Volhard procedure. See 1879: 14.

1892: 2. Bastin, C. Dosage du manganèse dans les spiegels et les ferro-manganèses.

Monit. scientif. (4), **6**, 639; Chem. Centrbl., **1892**, b, 632; Ztschr. angew. Chem., **1892**, 704; Wagner's Jsb., **38**, 118; J. Iron Steel Inst., **1893**, a, 403; Berg- u. hüttenm. Ztg., **52**, 59; J. Soc. Chem. Ind., **11**, 1037.

Determination by Williams procedure. See 1881: 18.

1892: 3. BLUM, L. Zur volumetrischen Bestimmung des Zinks.

Ztschr. anal. Chem., **31**, 60; Berg- u. hüttenm. Ztg., **51**, 164.
Separation from zinc by means of bromine in alkaline solution.

1892: 4. CAMPREDON. Dosage du manganèse dans les produits sidérurgiques.

Rev. chim. indust., **3**, 298.
Separation from iron by the acetate method, and volumetric determination by means of potassium permanganate.

1892: 5. CHEMIKER COMMISSION. Manganbestimmung: Erwiderung der Chemiker Commission des Vereins deutscher Eisenhüttenleute auf die Angriffe des Professors Hampe.

Stahl u. Eisen, **12**, 290; Chem. Centrbl., **1892**, a, 604; J. Iron Steel Inst., **1892**, a, 489; Ztschr., angew. Chem., **1892**, 275; Wagner's Jsb., **38**, 120.
Reply to Hampe, 1892: 9.

1892: 6. DENIGES. Natriumhypobromitlösung als Reagens auf Mangan. (*Title from Ztschr. anal. Chem.*)

* Deutsche-Amerikan. Apotheker Ztg., **11**, 75; Ztschr. anal. Chem., **31**, 316.
Detection by means of sodium hypobromite.

1892: 7. DONATH, E. Bemerkungen zur Vereinbarung einheitlicher Untersuchungsmethoden für Eisen und Stahl.

Chem. Ztg., **16**, 141.
Criticism of report of Chemiker-Commission. See 1891: 5 and 1892: 5.

1892: 8. FREY. Zur mikrochemischen Gesteinsanalyse. (*Title from Pharm. Centrh.*)

Schweiz. Wochenschr. Pharm., **30**, 149; Pharm. Centrh. (N. F.), **13**, 266; Ztschr. anal. Chem., **32**, 204.
Detection by means of microchemical tests.

1892: 9. HAMPE, W. Nochmals die Chloratmethode.

Chem. Ztg., **16**, 13; Chem. Centrbl., **1892**, a, 457; Ztschr. anorg. Chem., **1**, 389.
Criticism of the report of the Chemiker-Commission. See 1892: 5 and 1892: 7.

1892: 10. MOORE, T. The Determination of Cobalt in Manganese Ores, and a quick Method for its Estimation.

Chem. News, **65**, 75; **66**, 11; Ztschr. anorg. Chem. **1**, 392; Ber., **25**, 444, Ref.
Separation from cobalt with the aid of citric acid.

1892: 11. PRIWOZNIK. Mittheilungen über die im Laboratorium des K. K. General-Probieramtes in Wien in den Jahren 1890 und 1891 ausgeführten Analysen und anderweitigen Untersuchungen.

Berg- u. hüttenm. Jahrb., **40,** 475; Ztschr. angew. Chem., **1893,** 180; Wagner's Jsb., **38,** 216.

Separation from iron by the acetate method.

1892: 12. v. REIS, M. A. Zur Bestimmung von Mangan im Eisen.

Ztschr. anal. Chem., **31,** 604 and 672; Chem. Centrbl., **1892,** b, 940; **1893,** a, 133; J. Chem. Soc. (Lond.), **64,** b, 304; Ztschr. anorg. Chem., **3,** 337; Wagner's Jsb., **38,** 121; School Mines Quart., **14,** 159; Berg- u. hüttenm. Ztg., **52,** 107; J. Soc., Chem. Ind., **12,** 378; Dingl. pol. J., **289,** 214.

Oxidation of organic matter by the use of barium peroxide. Volumetric determination by the Volhard procedure. See 1887: 4 and 1879: 14.

1892: 13. v. REIS, M. A. Ueber Bestimmung des Mangans nach der Chloratmethode.

Chem. Ztg., **15,** 1791; Stahl u. Eisen, **12,** 28; J. Chem. Soc. (Lond.), **62,** 1132.

Comments on Hampe's article. See 1892: 9.

1892: 14. RIGGS, R. B. The Separation of Iron, Manganese, and Calcium by the Acetate and Bromine Methods.

Am. J. Sci. (3), **43,** 135; J. Anal. Chem., **6,** 94; Chem. Centrbl., **1892,** a, 1004; Ztschr. anorg. Chem., **3,** 235; J. Iron Steel Inst., **1893,** a, 403; Stahl u. Eisen, **13,** 119; J. Chem. Soc. (Lond.), **62,** 916; School Mines Quart., **13,** 286; J. Soc. Chem. Ind., **12,** 183.

Separation from iron and calcium as in title.

1892: 15. ROTHE, J. W. Trennung des Eisens von anderen Elementen nach einem neuen Verfahren.

Mitth. Kgl. Verst. zu Berlin, **10,** 132; Iron, **40,** 404; J. Iron Steel Inst., **1892,** b, 510.

Separation from iron by extraction with ether.

1892: 16. RUBRICIUS, H. Nachtrag zur modificierten Volhard'schen Manganprobe.

Chem. Ztg., **16,** 459; Oester. Ztschr. Berg- u. Hüttenw., **40,** 146; Chem. Centrbl., **1892,** a, 829; J. Iron Steel Inst., **1892,** b, 512; Ztschr. angew. Chem., **1892,** 274; Wagner's Jsb., **38,** 118; J. Chem. Soc. (Lond.), **62,** 1524; Dingl. pol. J., **285,** 286.

Experimental data to show accuracy of Volhard procedure (1879: 14).

1892: 17. RUBRICIUS, H. Manganbestimmung, mit specieller Berücksichtigung der verschiedenen Eisensorten.

Chem. Ztg., **16,** 209; Chem. Centrbl., **1892,** a, 507; Berg- u. hüttenm. Ztg., **51,** 163.

Determination in irons by the Volhard procedure (1879: 14).

1892: 18. Rüdorff, F. Quantitative Analyse durch Elektrolyse.

Ztschr. angew. Chem., 1892, 6; Chem. Centrbl., 1892, a, 331; J. Chem. Soc. (Lond.), **64**, b, 94.

Determination by electrolysis.

1892: 19. Schneider, L. Beiträge zur chemischen Untersuchung des Stahles.

Oester. Ztschr. Berg- u. Hüttenw., **40**, 46 and 235; Chem. Centrbl., 1892, a, 337; Ztschr. angew. Chem., 1892, 274 and 466; School Mines Quart., **14**, 362; Stahl u. Eisen, **12**, 471; Wagner's Jsb., **38**, 119; Berg- u. hüttenm. Ztg., **51**, 163; Ztschr. anorg. Chem., **1**, 474; J. Iron Steel Inst., 1892, b, 512; J. Soc. Chem. Ind. **12**, 293; **13**, 546; Dingl. pol. J., **291**, 238.

Determination in steel by oxidation to permanganic acid by means of lead peroxide and titration with hydrogen peroxide. Determination in chrome steel.

1892: 20. Van Grundy, C. P. Note on Textor's Rapid Method for the Determination of Manganese.

Proc. Eng. Soc. Western Penna., **8**, 158; J. Iron Steel Inst., 1892, b, 512.

Oxidation to permanganic acid by means of lead peroxide, and titration with arsenious acid. (Description of Textor procedure is given in this article. No other description has been found.)

1892: 21. Warwick, H. S. Die Elektrolyse von Metall-formiaten.

Ztschr. anorg. Chem., **1**, 298 and 299.

Electrolytic determination and separation from zinc and cadmium.

1893: 1. Carnot, A. (Discussion.)

Bull. soc. chim. (3), **9**, 214; Chem. Centrbl., 1893, b, 156; Chem. News, **68**, 15 and 301.

Comments on the paper by Gorgeu, 1893: 6.

1893: 2. Carnot, A. Sur la precipitation du manganèse par l'eau oxygenée et l'ammoniaque, en vue de son dosage pondéral ou volumétrique.

Bull. soc. chim. (3), **9**, 613; Chem. Centrbl., 1893, b, 596; Ztschr. anorg. Chem., **5**, 316.

See title.

1893: 3. Carnot, A. Sur l'essai des oxydes de manganèse par l'eau oxygenée.

Bull. soc. chim. (3), **9**, 646; C. R., **116**, 1295; Chem. Centrbl., 1893, b, 191; J. Chem. Soc. (Lond)., **64**, b, 497; J. Soc. Chem. Ind., **12**, 897; Ztschr. anorg., Chem., **6**, 81.

Determination by a gasometric method similar to that of Lunge. See 1885: 13.

1893: 4. CARNOT, A. Sur le dosage du manganèse par les méthodes oxydimétriques.

C. R., **116**, 1375; Chem. Centrbl., **1893**, b, 292; Ztschr. anorg. Chem., **5**, 100 and 249; J. Iron Steel Inst., **1893**, a, 530, Chem. News, **68**, 51; Chem. Ztg., **17**, 164 and 179, Rep.; Ber., **26**, 528 and 728, Ref.; School Mines Quart., **15**, 55; J. Soc. Chem. Ind., **12**, 787; Analyst, **18**, 231.

Determination by measurement of the gas evolved when manganese dioxide is titrated with hydrogen peroxide. See 1885: 13, 1890: 1, and 1893: 3.

1893: 5. CLARK, J. The Use of Sodium Peroxide as an Analytical Agent.

J. Chem. Soc. (Lond.), **63**, 1082; Ztschr. anal. Chem., **34**, 593.

Separation from zinc, nickel, and cobalt by means of sodium peroxide.

1893: 6. GORGEU, A. Observation sur le dosage du manganèse par le permanganate de potasse, et sur les permanganates de manganèse de M. Antony Guyard.

Bull. soc. chim. (3), **9**, 214 and 490; Chem. Centrbl., **1893**, b, 155; J. Iron Steel Inst., **1894**, a, 613; J. Chem. Soc. (Lond.), **65**, b, 33.

Comments on the procedures of Guyard and Donath. See also 1893: 1, 1863: 2, and 1881: 6.

1893: 7. HEMPEL, W. Ueber die Anwendung des Natriumsuperoxyds zur Analyse.

Ztschr. anorg. Chem., **3**, 193.

Detection by means of sodium peroxide.

1893: 8. JEAN, F. (Discussion.)

Bull. soc. chim. (3), **9**, 99; Chem. Centrbl., 1893, a, 665.

See 1893: 9.

1893: 9. JEAN, F. Dosage du manganèse dans ses minerais et ses alliages.

Bull. soc. chim. (3), **9**, 248; J. Chem. Soc. (Lond.), **64**, b, 498; School Mines Quart., **14**, 362; Ztschr. anorg. Chem., **4**, 479.

Precipitation by means of sodium carbonate, solution in nitric acid, precipitation by potassium chlorate, and determination as phosphate, sulphide, or oxide; also volumetrically by methods of Pattinson, Guyard, Gay-Lussac, and Campredon. Separation from iron by the acetate method. See also 1893: 8.

1893: 10. JULIAN, F. Laboratory Notes.

J. Am. Chem. Soc., **15**, 113; Chem. Centrbl., **1893**, b, 393.

Precipitation by means of potassium chlorate, and titration with hydrogen peroxide

1893: 11. Kosman, B. Zur Trennung von Eisen und Aluminium, Mangan, Zink und Calcium.

Stahl u. Eisen, 13, 431; Chem. Centrbl., **1893**, b, 155; J. Chem. Soc. (Lond.), **64**, b, 600; Ztschr. anorg. Chem., **4**, 397.
Separation from iron by the acetate method and precipitation by Wolff bromine procedure. Comments on Riggs method. See 1892: 14, and 1883: 22.

1893: 12. Low, A. H. Technical Estimation of Manganese in Ores.

J. Anal. Chem., **6**, 663; Chem. Centrbl., **1893**, a, 665; Chem. News, **67**, 162; J. Iron Steel Inst., **1893**, a, 418; Ztschr. anorg. Chem., **4**, 320; Stahl u. Eisen, **13**, 608; Monit. scientif., **43**, 207; J. Chem. Soc. (Lond.), **64**, b, 438; School Mines Quart., **14**, 256; Eng. Min. J., **55**, 124.
Determination in ores by precipitation by means of bromine, solution in oxalic acid, and titration with permanganate.

1893: 13. Parry, J., and Morgan, J. J. The Analysis of Iron and Steel.

Chem. News, **67**, 295; Ind. and Iron, **1893**, 379; Stahl u. Eisen, **13**, 898; School Mines Quart., **15**, 64.
Separation from iron by the acetate method, and precipitation by bromine; also colorimetric method and study of Williams method (1881: 18).

1893: 14. Rüdorff, F. Quantitative Analyse durch Elektrolyse.

Ztschr. angew. Chem., **1893**, 452.
Electrolytic determination, and separation from copper.

1894: 1. Christomanos, A. C. Ueber einen neuen Kohlensäurebestimmungs-Apparat.

Ber., **27**, 2748; J. Soc. Chem. Ind., **13**, 1221.
Modified apparatus for use with the Bunsen method for the determination of the peroxide (1853: 1).

1894: 2. Classen, A. Quantitative Analyse durch Elektrolyse.

Ber., **27**, 2075; J. Chem. Soc. (Lond.), **66**, b, 480; Ztschr. anorg. Chem., **16**, 269; Ztschr. Elektrochem., **1**, 290.
Determination by electrolysis.

1894: 3. Fleitmann, T. Ueber die quantitative Bestimmung der gewöhnlichsten Beimischungen des im Handel vorkommenden Reinnickels, oder Walznickels.

Ztschr. anal. Chem., **33**, 337.
Determination in commercial nickel.

1894: 4. JONES, H. C. Sur l'essai des oxydes du manganèse par l'eau oxygenée.

C.R., **117**, 781; Chem. Centrbl., **1894**, a, 229; Ber., **27**, 33, Ref.; J. Chem. Soc. (Lond.), **66**, b, 121.

Comments on Carnot's articles (1893: 1–4).

1894: 5. JONES, J. Rapid Method for the Determination of Manganese in Manganese Bronze.

J. Am. Chem. Soc., **15**, 414; Chem. Centrbl., **1894**, a, 108; Ztschr. anal. Chem., **37**, 338; Eng. Min. J., **57**, 347; Chem.-techn. Rep., **34**, a, 297; Monit. scientif., **36**, 521; School Mines Quart., **15**, 151; Berg- u. hüttenm. Ztg., **53**, 189.

Determination by the Hampe chlorate method (1883: 4).

1894: 6. KASSNER, O. Ueber Natriumsuperoxyd und seine Anwendung in der Analyse.

Arch. Pharm., **232**, 226; Ztschr. anal. Chem., **34**, 595; J. Chem. Soc. (Lond.), **66**, b, 429.

Separation from chromium by means of sodium peroxide.

1894: 7. KIPPENBERGER, C. Ein einfacher Apparat für gasanalytische Zwecke.

Ztschr. angew. Chem., **1894**, 714; Ztschr. anal. Chem., **35**, 185.

Apparatus for gasometric determination of peroxide by measurement of oxygen evolved during reaction with hydrogen peroxide.

1894: 8. LUNGE, G. Volumétre à gaz universel.

Bull. soc. chim. (3), **11**, 636.

Gasometric determination of peroxide.

1894: 9. NASS, G. Ueber die quantitative Bestimmung von Mangan, Magnesium, Zink, Kobalt und Nickel, mittels der Oxalatmethode nach Prof. A. Classen.

Ztschr. angew. Chem., **1894**, 501; Chem. Centrbl., **1894**, b, 601; Ztschr. anorg. Chem., **7**, 364; Chem. Ztg., **18**, 227, Rep.; Ber., **28**, 22, Ref.; J. Chem. Soc. (Lond.), **66**, b, 482; J. Soc. Chem. Ind., **14**, 69.

General study of Classen's method. See 1877: 3 and 7.

1894: 10. NEUMANN, G. Quantitative Analyse von Schwermetallen durch Titriren mit Natriumsulfid.

Monatsh. Chem. **15**, 495; J. Chem. Soc. (Lond.), **68**, b, 64; Chem. News, **72**, 212; Ztschr. anal. Chem., **34**, 454.

Addition of alkaline sulphide in excess, filtration, addition of sulphuric acid in excess, and titration with alkali.

1894: 11. POLECK, T. Ueber Natriumsuperoxyd.

Ber., **27**, 1052.

Separation from chromium by means of sodium peroxide. See 1894: 6.

1894: 12. Rüdorff, F. Quantitative Analyse durch Elektrolyse.

Ztschr. angew. Chem., **1894,** 388; J. Chem. Soc. (Lond.), **66,** b, 399.
Separation from mercury.

1894: 13. Saniter, E. H. A Review of Some of the Methods in General Use for the Estimation of Manganese in Minerals and Metals.

J. Soc. Chem. Ind., **13,** 112; Ber., **28,** 75, Ref.; J. Iron Steel Inst., **1894,** a, 613; J. Chem. Soc. (Lond.), **66,** b, 333; School Mines Quart., **15,** 275; Eng. Min. J., **57,** 155.
Tests of methods involving precipitation as peroxide by bromine, and as sulphide and phosphate; also Volhard's and Pattinson's methods.

1894: 14. Seeliger, R. Quantitative Trennung von Ferriphosphat, Manganophosphat, Calcium- und Magnesiumphosphat.

* Dissertation, Erlangen; Pharm. Centrh. (2), **14,** 685; Chem. Centrbl., **1894,** a, 107; J. Chem. Soc. (Lond.), **66,** b, 255.
Determination by permanganate, and by Rössler silver method (1879: 13). Separation from iron by fusion with silica and alkaline carbonates and nitrates.

1894: 15. Smith, E. F., and Heyl, P. Ueber die Verwendung von Quecksilberoxyd bei der Analyse.

Ztschr. anorg. Chem., **7,** 85, 88, and 89; Ber. **27,** 758, Ref.; Ztschr. anal. Chem., **34,** 74 and 75.
Separation from iron by means of mercuric oxide.

1894: 16. Thomälen, H. Ueber die von Rüdorff empfohlenen Methode der quantitativen Analyse durch Elektrolyse.

Chem. Ztg., **18,** 1353; Chem. Centrbl., **1894,** b, 667.
Electrolytic determination. See 1892: 18.

1894: 17. Ullmann, C. Apparat zur Braunsteinbestimmung nach der Bunsen'schen Methode.

Chem. Ztg., **18,** 478; Chem. Centrbl., **1894,** a, 878; Ztschr. anal. Chem., **37,** 387; Ber., **27,** 524 Ref.; J. Chem. Soc. (Lond.), **68,** b, 88; J. Soc. Chem. Ind. **13,** 979.
See title and 1888: 5; also 1894: 1.

1895: 1. Alvarez, P., and Jean, J. Recherche du zinc, du chrome, du manganèse et du fer.

Répert. de pharm. **1895,** 440; Chem. Centrbl., **1896,** b, 513; Pharm. Centrh., **37,** 472; J. Chem. Soc. (Lond.), **72,** b, 600.
Detection by oxidation to permanganic acid by means of lead peroxide in nitric acid solution.

1895: 2. AUCHY, G. The Volumetric Estimation of Manganese.

J. Am. Chem., Soc., **17,** 943; Chem. Centrbl., **1896,** a, 460; J. Chem. Soc. (Lond.), **70,** b, 339; School Mines Quart., **17,** 313; J. Soc. Chem. Ind., **15,** 220.

Criticism and comments on the Williams (1881: 18) and the Volhard (1879: 14) methods.

1895: 3. BODLÄNDER, G. Das Gasgravimeter für chemische Analyse auf gasometrischen Wege.

Ztschr. angew. Chem. **1895,** 55.

Determination of peroxide in pyrolusite (or after precipitation by potassium chlorate from iron), by means of hydrogen peroxide.

1895: 4. CARNOT, A. (Title unknown).

* Echo Mines, **1895;** Berg- u. hüttenm Ztg., **1895,** 173; Wagner's Jsb., **41,** 199; * Génie civil, **26,** 140; J. Iron Steel Inst., **1895,** a, 507.

Precipitation with hydrogen peroxide, solution of the precipitate in an excess of oxalic acid, and titration for this excess.

1895: 5. ENGELS, C. Vorläufige Mittheilung.

Ztschr. anorg. Chem., **9,** 78; J. Chem. Soc. (Lond.), **68,** b, 419; Chem. Centrbl., **1895,** b, 183; Ber., **28,** 628, Ref.

Electrolytic precipitation with the aid of hydrogen peroxide.

1895: 6. ENGELS, C. Quantitative Bestimmung von Mangan und Zink durch Elektrolyse.

Ber., **28,** 3182; Ztschr. Elektrotech. u. Elektrochem., **2,** 413; Chem. Centrbl., **1896,** a, 327; Bull. soc. chim. (3), **16,** 744; Ztschr. anorg. Chem., **12,** 400; Chem. Ztg., **20,** 44, Rep.; Ztschr. angew. Chem., **1896,** 76; J. Chem. Soc. (Lond.), **70,** b, 276; J. Soc. Chem. Ind., **15,** 219; Wagner's Jsb., **42,** 335; Ann. chim. anal. appl., **1,** 119.

Deposition as peroxide from a solution containing much sodium acetate and chrome alum, or a hydroxylamine salt.

1895: 7. FORESTIER, H. Essai des aciers, fers et fontes par l'analyse chimique.

Bull. soc. chim. (3), **13,** 587.

Separation from iron by the acetate method or with zinc oxide. Determination by precipitation by means of chlorate or hydrogen peroxide, and ignition to mangano-manganic oxide; or titration with ferrous sulphate or oxalic acid solution; or colorimetric determination by oxidation to permanganic acid by lead peroxide or bismuth tetroxide.

1895: 8. GRÖGER, M. Zur elektrolytischen Bestimmung des Mangans.

Ztschr. angew. Chem., **1895,** 253; Chem. Centrbl., **1895,** a, 1190; School Mines Quart., **16,** 376; Ztschr. anorg. Chem., **11,** 69; **12,** 400; Ber., **28,** 567, Ref.; Berg- u. hüttenm. Ztg., **54,** 211; Chem.-techn. Rep., **34,** 274; J. Chem. Soc. (Lond.), **68,** b, 419.

Criticism of Rudorff electrolytic method. Precipitation by electrolysis and determination as peroxide. See also 1892: 18.

1895: 9. JANNASCH, P., and v. CLOEDT, E. Ueber quantitative Metalltrennungen in alkalischen Lösung durch Wasserstoffsuperoxyd. XI. Die Trennung des Wismuths, Bleis und Mangans von Quecksilber.

Ber., **28**, 994; Chem. News, **72**, 65; Chem. Centrbl., **1895**, b, 64; Bull. soc. chim. (3), **14**, 1354; J. Chem. Soc. (Lond.), **68**, b, 332; Ann. chim. anal. appl., **1**, 75.

Separation from mercury by means of hydrogen peroxide.

1895: 10. JANNASCH, P., and v. CLOEDT, E. Ueber quantitative Metalltrennungen in alkalischen Lösung durch Wasserstoffsuperoxyd. XIII. Die Trennung des Chroms von Mangan, Eisen und Aluminium.

Ztschr. anorg. Chem., **10**, 398; Chem. Centrbl., **1896**, a, 220; J. Chem. Soc. (Lond.), **70**, b, 222.

Separation from chromium by means of hydrogen peroxide.

1895: 11. JANNASCH, P., and v. CLOEDT, E. Ueber die Trennung des Mangans von Zink in ammonialkalischer Lösung durch Wasserstoffsuperoxyd unter Anwendung von Druck.

Ztschr. anorg. Chem., **10**, 405; Chem. Centrbl., **1896**, a, 221; J. Chem. Soc. (Lond.), **70**, b, 220; Chem.-techn. Rep., **34**, a, 275.

See title.

1895: 12. JANNASCH, P., and KAMMERER, H. Ueber quantitative Metalltrennungen in alkalischen Lösung durch Wasserstoffsuperoxyd. XII. Die Trennung des Mangans von Silber und des Wismuth von Kobalt.

Ber., **28**, 1407; Chem. Centrbl., **1895**, b, 254; Chem. News, **72**, 91; J. Chem. Soc. (Lond.), **68**, b, 423; J. Soc. Chem. Ind., **14**, 1889; Bull. soc. chim. (3), **14**, 1273.

Separation from silver by means of hydrogen peroxide.

1895: 13. JANNASCH, P., and KAMMERER, H. Ueber quantitative Metalltrennungen in alkalischen Lösung durch Wasserstoffsuperoxyd. XIV. Trennung des Arsens von Eisen und Mangan.

Ztschr. anorg. Chem., **10**, 408; Chem. Centrbl., **1896**, a, 221; J. Chem. Soc. (Lond.), **70**, b, 221.

Separation from arsenic by means of hydrogen peroxide.

1895: 14. JANNASCH, P., and RÖTTGEN, A. Ueber quantitative Metalltrennungen in alkalischen Lösung durch Wasserstoffsuperoxyd. X. Trennung des Wismuths und des Bleies von Cadmium, sowie diejenige des Mangans von Kupfer und Cadmium.

Ztschr. anorg. Chem., **8**, 307, 310, and 312; Chem. Centrbl., **1895**, a, 1042; Ber., **28**, 435, Ref.; J. Chem. Soc. (Lond.), **68**, b, 332.

Separation from copper and cadmium by means of hydrogen peroxide.

1895: 15. v. Jüptner, H. Einige Ursachen der mangelnden Uebereinstimmung bei Manganbestimmungen in Ferromangan.

Oester. Ztschr. Berg- u. Hüttenw., **43**, 166; J. Iron Steel Inst., **1895**, a, 140; Stahl u. Eisen, **15**, 416; Berg- u. huttenm. Ztg., **54**, 235.

Variation in the results obtained in the determination in ferromanganese caused in part by variation in atomic weights chosen.

1895: 16. Neumann, B. Welche electrolytischen Methoden sind in der analytischen Praxis mit Vorteil verwendbar?

Ztschr. Electrochem., **1895**, 231 and 252; Ztschr. anorg. Chem., **12**, 399.

General discussion of methods of determination, especially electrolytic methods.

1895: 17. Reddrop, J., and Ramage, H. The Volumetric Determination of Manganese.

Proc. Chem. Soc. (Lond.), **1895**, 33; J. Chem. Soc. (Lond.), **67**, 268; Ber., **28**, 652; **29**, 698. Ref.; Chem. Centrbl., **1895**, a, 1042; Wagner's Jsb., **42**, 182; J. Soc. Chem. Ind., **14**, 305; Chem. News, **71**, 122; Bull. soc. chim. (3), **14**, 1183; School Mines Quart., **17**, 313; J. Iron Steel Inst., **1895**, a, 508.

Comments on Schneider's method. Oxidation with sodium bismuthate and titration with hydrogen peroxide. See 1889: 17.

1895: 18. Thomas, W. S. Methods for the Determination of Manganese.

Bull. Missouri Min. Club, **1895**, 35; J. Am. Chem. Soc., **17**, 341; Chem. Centrbl., **1895**, a, 1083; J. Iron Steel Inst., **1895**, b, 595; Chem. Ztg., **19**, 155, Rep.; Bull. soc. chim. (3), **14**, 921; J. Chem. Soc. (Lond.), **68**, b, 420; School Mines Quart., **16**, 376; Stahl u. Eisen, **15**, 1059; Berg- u. hüttenm. Ztg., **54**, 326.

Criticism of the Low method. Recommends the use of the Volhard method. See 1893: 12.

1895: 19. Ulzer, F., and Brüll, J Ueber die Manganbestimmung im Roheisen.

Mitth. technol. Gen. Mus. (Wien), **1895**, 312; J. Iron Steel Inst., **1896**, b, 442; **1897**, b, 497; Chem. Ztg., **20**, 36, Rep.; Ztschr. angew. Chem., **1896**, 78; Wagner's Jsb., **42**, 103; Stahl. u. Eisen, **16**, 633; Berg- u. hüttenm. Ztg., **55**, 301; J. Soc. Chem. Ind., **15**, 296; Analyst, **21**, 139; Chem. Centrbl., **1897**, a, 769; J. Chem. Soc. (Lond.), **72**, 350; Ann. chim. anal. appl., **1**, 135.

Separation from iron by zinc oxide, precipitation by means of hydrogen peroxide, solution in oxalic acid, and titration for the excess of the latter. Discussion of Hampe, Weissmann, and Vortmann articles. See 1883: 4, 1888: 20, and 1890: 16.

1896: 1. AUCHY, G. Sources of Error in Volhard's and Similar Methods of Determining Manganese in Steel.

J. Am. Chem. Soc., 18, 498; Chem. Centrbl., **1896**, b, 208; Chem. News, **74**, 214, 248, and 262; J. Chem. Soc. (Lond.), **70**, b, 627; School Mines Quart., **18**, 43; Eng. Min. J., **61**, 111; J. Soc. Chem. Ind., **15**, 677; Analyst, **21**, 335.

Sources of error in volumetric and colorimetric determinations. See 1879: 14, and 1896: 15.

1896: 2. BURGASS, R. Anwendung des Nitroso-β-naphthols in der anorganischen Analyse.

Ztschr. angew. Chem., **1896**, 601; J. Chem. Soc. (Lond.). **72**, b, 163.

Separation from iron, copper, and cobalt by means of nitroso-β-naphthol.

1896: 3. BÜTTGENBACH, F. Estimation de la valeur du manganèse dans les minerais de fer.

Rev. univers. de mines, **32**, 317; Berg- u. hüttenm. Ztg., **55**, 368; Oester. Ztschr. Berg- u. Hüttenw., **1896**, 65; Wagner's Jsb., **42**, 182; J. Chem. Soc. (Lond.), **74**, b, 52.

Determination by assay tests on manganese ores.

1896: 4. DEWEY, F. P. The Actual Accuracy of Chemical Analysis.

Trans. Am. Inst. Min. Eng., **26**, 370; J. Am. Chem. Soc., **18**, 808.

Determination, and a comparison of the results obtained by various chemists.

1896: 5. DUDLEY, C. B. Some Present Possibilities in the Analysis of Iron and Steel.

J. Am. Chem. Soc., **19**, 104.

Volumetric determination by precipitation with chlorate and titration with oxalic acid or ferrous sulphate solution in comparison with gravimetric determination as phosphate.

1896: 6. ENGELS. Beiträge zur Elektroanalyse der Metalle der Schwefelammoniumgruppe.

Chem. Rundschau, **1896**, 5 and 22; Chem. Centrbl., **1897**, a, 258; Ztschr. anorg. Chem., **14**, 439; J. Chem. Soc. (Lond.), **74**, b, 192.

Separation from iron and nickel by electrolysis.

1896: 7. GIORGIS, G. Sul dosamento del manganese e del cromo nei prodotti siderurgici.

Gazz. chim. ital., **26**, b, 528; Chem. Centrbl., **1897**, a, 436; Bull. soc. chim. (3), **18**, 953; J. Iron Steel Inst., **1897**, b, 498; J. Chem. Soc. (Lond.), **72**, b, 350.

Determination by addition of the solution to an excess of potassium permanganate and titration for the excess with a solution of chromium sulphate.

1896: 7a. HANDY, J. O. Aluminium Analysis.

J. Am. Chem. Soc., **18,** 766; Ann. chim. anal. appl., **2,** 90.

Determination in aluminium-manganese alloys by the Williams method.

1896: 8. JANNASCH, P. Ueber Trennungen des Mangans von Kupfer und Zink (Wasserstoffsuperoxyd Methode), sowie des Kupfers von Zink und Nickel (Schwefelwasserstoff und Rhodanmethode) nebst ergänzenden Bemerkungen.

Ztschr. anorg. Chem., **12,** 134; Chem. Centrbl., **1896,** b, 208; J. Chem. Soc. (Lond.), **70,** b, 546; Ber., **29,** 696, Ref.; Analyst, **22,** 80.

1896: 9. JANNASCH, P., and LEHNERT, H. Ueber quantitative Metalltrennungen in alkalischer Lösung durch Wasserstoffsuperoxyd. XV. Trennungen in natronalkalischer Lösung.

Ztschr. anorg. Chem., **12,** 126; Chem., Centrbl. **1896,** b, 209; J. Chem., Soc. **70,** b, 547; Ber., **29,** 695, Ref.

Separation from cobalt and nickel by means of hydrogen peroxide in alkaline potassium cyanide solution.

1896: 10. v. JÜPTNER, H. Einige Ursachen der mangelnden Uebereinstimmung bei Manganbestimmungen im Ferromangan.

Oester. Ztschr. Berg- u. Hüttenw., **44,** 15; Chem. Centrbl., **1896,** a, 513; Chem. Ztg., **20,** 52, Ref.; Analyst, **21,** 196.

Criticism of methods of standardizing permanganate solutions.

1896: 11. MIGNOT, A.

* Rev. chim. anal. appl., **4,** 329 and 390; Chem. Ztg., **20,** 234 and 275, Rep.

Separation from iron with ammonium succinate, precipitation with chlorate, and re-precipitation with bromine or salt of phosphorus. Also colorimetric determination by oxidation by means of lead peroxide or bismuth tetroxide in nitric acid solution.

1896: 12. MIXER, C. T., and DUBOIS, H. W. Särnström's Method of Determining Manganese in Iron Ores.

J. Am. Chem. Soc., **18,** 385; Chem. Centrbl., **1896,** a, 1082; Chem. News, **75,** 51; J. Chem. Soc. (Lond.), **70,** b, 547; Bull. soc. chim. (3), **16,** 1416; J. Iron Steel Inst., **1896,** b, 448; School Mines Quart., **18,** 43; Ann. chim. anal. appl., **1,** 196.

Determination by the Swedish method as modified by Särnström. See 1881: 15.

1896: 13. MURKEWITSCH, M. Bestimmung des Mangans in Gusseisen, Stahl, Eisen und dergl. (*Title from Chem. Ztg.*)

* Gornij. J., **1896,** 396; Chem. Ztg., **20,** 220, Rep.; Oester. Ztschr. Berg- u. Hüttenw., **46,** 53.

Determination by the Volhard method. See 1879: 14

1896: 13a. NEUMANN, B. Die elektrolytische Bleibestimmung u. ihre Beeinflussung durch die Gegenwart von Arsen, Selen, Mangan.

Chem. Ztg., **20,** 383.
Separation from lead by electrolysis.

1896: 14. RÜRUP, L. Vergleichende Manganbestimmungen in Stahl und Eisen.

Chem. Ztg., **20,** 285 and 337; Chem. Centrbl., **1896,** a, 1144 and 1178; Ztschr. anorg. Chem., **15,** 383; Berg- u. hüttenm. Ztg., **55,** 216; Analyst, **21,** 218; J. Iron Steel Inst., **1896,** a, 535.
Comparative determinations as manganous sulphate, as mangano-manganic oxide, by removal of the iron with sodium sulphate and titration with permanganate, by the Ford, the Volhard, and the Hampe chlorate methods. See 1881: 8, 1879: 14, and 1883: 4.

1896: 15. STONE, G. C. Remarks on Mr. Auchy's Paper on the Volumetric Determination of Manganese.

J. Am. Chem. Soc., **18,** 228; Chem. Centrbl., **1896,** a, 1028; Bull. soc. chim. (3), **16,** 1238; J. Iron Steel Inst., **1896,** b, 443; J. Chem. Soc. (Lond.), **70,** b, 547; School Mines Quart., **18,** 43.
Recommends the Volhard method with slight modification. See 1896: 1.

1896: 16. TAGGART, W. T., and SMITH, E. F. The Separation of Manganese from Tungstic Acid.

J. Am. Chem. Soc., **18,** 1053; Chem. Centrbl., **1897,** a, 309; Chem. News, **75,** 26; Chem. Ztg., **21,** 10, Rep.; Bull. soc. chim. (3), **18,** 626; J. Chem. Soc. (Lond.), **72,** b, 433; J. Soc. Chem. Ind. **16,** 164.
Inadvisability of using ammonium sulphide or alkaline carbonates in effecting a separation from tungstic acid.

1896: 17. VIARD, G. Sur le dosage du manganèse en présence de l'acid phosphorique.

Bull. soc. chim. (3), **15,** 973; Chem. Centrbl., **1896,** b, 600; J. Chem. Soc. (Lond.), **72,** b, 519; J. Soc. Chem. Ind., **15,** 677; Ann. chim. anal. appl., **1,** 332.
Inapplicability of the Hannay, and the Beilstein and Jawein method of determination, in the presence of phosphoric acid. See 1877: 10 and 1879: 1.

1897: 1. AUCHY, G. A Method for the Complete Analysis of Iron Ores, with Notes on Särnström's Method of Determining Manganese.

J. Am. Chem. Soc., **19,** 139; Chem. Centrbl., **1897,** a, 883; J. Iron Steel Inst., **1898,** a, 539; J. Chem. Soc. (Lond.), **72,** b, 603.
Comments on Särnström's method. See 1881: 15.

1897: 2. van Bemmelen, J. M. Beiträge zur Analyse der Ackerböden. (*Title from Ztschr. anal. Chem.*)

* Landw. Vers.-Stat., **37**, 279; Ztschr. anal. Chem., **36**, 799.
Determination in soils by the Carnot method. See 1888: 2.

1897: 3. Brearley, H. The Estimation of Manganese in Spiegels.

Chem. News, **75**, 13; Chem. Centrbl. **1897**, a, 335; Bull. soc. chim. (3), **18**, 1300; J. Iron Steel Inst., **1897**, b, 498; J. Chem. Soc. (Lond.), **72**, b, 233.
Application of Wright and Menke's modification of Guyard's method to the determination of manganese in the filtrate from the acetate separation. See 1880: 17 and 18.

1897: 4. Brearley, H. Separation with Alkaline Acetates.

Chem. News, **76**, 165; Chem. Centrbl., **1897**, b, 911; J. Chem. Soc. (Lond.), **74**, b, 96.
Separation from iron by the acetate method.

1897: 5. Cushman, A. R. A New and Rapid Method for the Qualitative Separation of Iron, Aluminium, Chromium, Manganese, Zinc, Nickel, and Cobalt.

Am. Chem. J., **19**, 606; Chem. Centrbl., **1897**, b, 434; J. Chem. Soc. (Lond.), **72**, b, 518; Ann. chim. anal. appl., **3**, 20.
Qualitative detection and separation. Use of bromine in connection with alkaline hydroxides.

1897: 6. Devisse, N. De la calcination des minerais manganesiferes carbonates.

Rev. univ. des mines (3), **39**, 1897; Chem. News, **76**, 212; J. Chem. Soc. (Lond.), **74**, b, 142.
Volumetric determination by the Volhard method.

1897: 7. Engels, C. Quantitative Bestimmung von Mangan durch Elektrolyse.

Ztschr. Elektrochem., **3**, 286 and 305; Chem. Centrbl., **1897**, a, 308 and 436; Ztschr. anorg. Chem., **14**, 438; Chem. Ztg., **21**, 40, Rep.; J. Chem. Soc. (Lond.), **74**, b, 52; J. Soc. Chem. Ind., **16**, 262; Dingl. pol. J., **304**, 262.
See title.

1897: 8. Granger, A. Sur les phosphures de chrome et de manganèse.

C. R., **124**, 190; Chem. News, **75**, 95.
Determination as sulphide in chromium and manganese phosphides.

1897: 8a. Hillebrand, W. F. Some Principles and Methods of Analysis Applied to Silicate Rocks.

Bull. U. S. Geol. Surv. **No. 148**, 41; Chem. News, **78**, 80.
Separation from cobalt, nickel, and copper by solubility of sulphides in hydrochloric acid. Precipitation as carbonate and ignition to oxide. Comments on Jannasch and Cloedt's separation from zinc. See 1895: 11.

1897: 9. Julian, F. Manganbestämningsmetod.

Jern.-Kont. Ann., **52,** 118; Berg.- u. hüttenm. Ztg., **56,** 410; J. Iron Steel Inst., **1898,** b, 557; Chem. Ztg., **21,** 313, Rep.; J. Soc. Chem. Ind., **17,** 185; Ann. chim. anal. appl., **3,** 56.

Precipitation by chlorate in the presence of nitric acid, solution of the precipitate in an excess of hydrogen peroxide, and titration for this excess with permanganate.

1897: 10. Longi, A., and Camilla, S. Intorno alla determinazione del manganese nelle soluzioni manganose e permanganiche.

Gazz. chim. ital., **27,** a, 97; Chem. Centrbl. **1897,** a, 619; Ztschr. anorg. Chem., **17,** 158; **18,** 403; Bull. soc. chim. (3), **18,** 952; J. Chem. Soc., **72,** b, 387.

Modification of the Volhard method (1879: 14).

1897: 11. Lemaire, M. Dosage colorimétrique du manganèse.

* Bull. soc. pharm. Bordeaux, **1897,** 268; Chem. News, **76,** 219; Ann. chim. anal. appl., **2,** 409.

Colorimetric method, determination in plants. Oxidation to permanganic acid in nitric acid solution by means of lead peroxide.

1897: 12. Miller, E. H. Notes on the Ferrocyanides of Zinc and Manganese.

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Use of hydrofluoric acid to hold the silica in solution when precipitating manganese peroxide by the Williams method (1881: 18).

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Determination as sulphate and as oxide.

1898: 8. Gooch, F. A., and Austin, M. On the Determination of Manganese as the Pyrophosphate.

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Precipitation with sodium chlorate and solution of the oxide in a sulphuric acid and potassium iodide solution, and titration for the liberated iodine with thiosulphate; or reduction of the oxide with arsenious acid and titration of the excess of that reagent.

1898: 10. DE GRAMONT, A. Analyse spectrale de quelques minéraux non conducteurs par les sels fondus et réactions des éléments.

C. R., **126,** 1513; J. Chem. Soc. (Lond.), **74,** b, 636.

Detection by spectrum analysis.

1898: 11. HILLEBRAND, W. F. See 1897: 8a.

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Separation from mercury.

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* Ztschr. öffenlich. Chem., **1898,** 459; Wagner's Jsb. **44,** 120; J. Soc. Chem. Ind., **17,** 951; J. Chem. Soc. (Lond.), **76,** 251.

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Wien. Akad. Ber. (2b), **107,** 434; Monatsh. Chem., **19,** 404; Chem. Centrbl., **1898,** b, 1035; Analyst, **24,** 51; Ann. chim. anal. appl., **4,** 203.: J. Soc. Chem. Ind., **17,** 1186; J. Chem. Soc. (Lond.), **76,** 126; Chem. News, **81,** 60.

Addition of mercuric chloride, precipitation of mercuric sulphide and manganous sulphide together, and expulsion of the mercuric sulphide by the ignition of the precipitate, in presence of hydrogen, in a special form of crucible.

1898: 16. MURMANN, E. Bemerkungen zur Analyse von Schmiedeeisen.

Oester. chem. Ztg., **1,** 383; Chem. Centrbl. **1898,** b, 1282; School Mines Quart., **20,** 303.

Gravimetric determination as sulphide.

1898: 17. NOTHOMB, M. Apparat zur Werthbestimmung des Braunsteins.

Chem. Ztg., **22,** 80; Chem. Centrbl., **1898,** a, 631; Analyst, **23,** 111.
Determination by loss of weight on treatment with oxalic acid.

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C. R., **126,** 550; Chem. Centrbl., **1898,** a, 753; Chem. News, **77,** 108; Chem.-techn. Rep., **37,** 286; J. Soc. Chem. Ind., **17,** 273; Ann. chim. anal. appl., **3,** 123.
Oxidation in a nitric acid solution by means of lead peroxide.

1898: 19. PICHARD, P. Contribution à la recherche du manganèse dans les minéraux, les végétaux et les animaux.

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Detection by colorimetric test. See also 1898: 18.

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* Boll. chim. Farm., **37,** 545; Chem. Centrbl., **1898,** b, 942; J. Chem. Soc. (Lond.), **76,** 251; Ann. chim. anal. appl., **3,** 408.
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Chem. News, **79,** 47 and 83.
A query on Mr. Daw's article on the Volhard process (1899; 4).

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Chem. News, **79,** 193; J. Chem. Soc. (Lond.), **76,** 815.
Separation from iron by the acetate method.

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Chem. News, **80,** 233, 245, 257, 271.
A compilation of references from the Chemical News, 1860–1899, Journal of the Chemical Society (London), 1885–1898, and the Journal of the Iron and Steel Institute, 1880–1899, bearing on manganese in its relations to iron and steel analysis.

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Criticism of the Volhard method (1879: 14).

1899: 5. DUNNINGTON, F. P. Composition of Manganese Pyrophosphate.

Chem. News, **79**, 275.

A notice of an error in "Fresenius Quantitative Analysis" (1876, Vol. 1).

1899: 6. FERNBERGER, H. M., and SMITH, E. F. The Electrolysis of Metallic Phosphate Solutions.

J. Am. Chem. Soc., **21**, 1001.

Electrolytic separation from copper.

1899: 7. FRIEDHEIM, C., and BRÜHL, E. Kritische Studien ueber die Anwendung des Wasserstoffsuperoxyds in der quantitativen Analyse.

Ztschr. anal. Chem., **38**, 686; J. Soc. Chem. Ind., **19**, 170.

Criticism of the work done by Jannasch regarding the use of hydrogen peroxide for the separation from copper, zinc, nickel, and chromium. See 1895: 10, 11, and 14, and 1896: 8 and 9.

1899: 8. HERTING, O. Beitrag zur Bestimmung des Kohlenstoffs, des Kupfers und Mangans im Eisen.

Ztschr. angew. Chem. **1899**, 1193; ,Chem. Centrbl., **1900**, a. 226; Wagner's Jsb., **45**, 129.

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Separation from aluminum by means of phenylhydrazine.

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* Ann. Soc. chim. Melano, **1899**, 54; Chem. Centrbl., **1899**, a. 1224; J. Iron Steel. Inst., **1900**, a. 433; J. Chem. Soc. (Lond.), **78**, 50.

Use of the Volhard method (1879: 14).

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Monatsh. Chem., **20**, 12.
Colorimetric determination in the water of the Red Sea.

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Ann. chim. anal. appl., **4**, 398.
Detection by microchemical tests.

1899: 13. REICHARD, C. Ueber die maassanalytische Bestimmung des Mangans in den mangansauren Salzen durch alkalische Lösungen von arseniger Säure.
Chem. Ztg., **23**, 801; Chem. Centrbl., **1899**, b, 886; J. Soc. Chem. Ind., **18**, 1156; J. Chem. Soc. (Lond.), **76**, b, 813; Chem. News, **82**, 308.
See title.

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Chem. Ztg., **23**, 867; Chem. Centrbl., **1900**, a, 66; J. Chem. Soc. (Lond.), **78**, 109; Ann. chim. anal. appl., **5**, 394; Analyst., **25**, 23.
See title.

1899: 15. RIEDERER, E. J. Electrolytic Determination of Zinc in the Presence of Manganese.
J. Am. Chem. Soc., **21**, 789; J. Chem. Soc. (Lond.), **78**, 49; Ann. chim. anal. appl., **5**, 266; Analyst, **25**, 79.
Separation from zinc by electrolysis.

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Chem. News, **79**, 157.
Note on the Ford-Williams method (1881: 18).

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Ber., **33**, 1019; Chem. Centrbl. **1900**, a, 1140; J. Soc. Chem. Ind., **19**, 564; Chem. News, **82**, 247; J. Chem. Soc. (Lond.), **78**, 443; Analyst, **25**, 304.
Full discussion of the conditions which give the best results in the determination as pyrophosphate.

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Ztschr. anal. Chem., **39**, 784.
Precipitation in the presence of a moderate excess of ammonium chloride and determination by weighing as ammonium manganese phosphate or the pyrophosphate. Comments on the article by Gooch and Austin. See 1898: 8.

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Bull. U. S. Geol. Surv., **No. 176**, 60.
Separation from nickel and cobalt by means of the solubility of their sulphides. Precipitation as carbonate. Comments on the Jannasch and Cloedt method of separation from zinc by means of hydrogen peroxide. See 1895: 11 and 1899: 7.

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Chem. News, **81**, 15; Chem. Centrbl., **1900**, a, 489; J. Chem. Soc. (Lond.), **78**, 444; Ann. chim. anal. appl., **5**, 230; School Mines Quart., **22**, 94.
Precipitation by electrolysis and ignition to mangano-manganic oxide.

1900: 5. IBBOTSON, F., and BREARLEY, H. The Estimation of Manganese and Chromium in Tungsten Alloys.

Chem. News, **82**, 209; Chem. Centrbl., **1900**, b. 1188; Chem. Ztg., **24**, 347, Rep.
Volumetric determination by oxidation to permanganate by means of lead peroxide in nitric acid solution, and titration with a reducing agent. Hydrofluoric acid used to aid in the solution of the alloy. (See also Norris, 1891: 19, and Ford and Bregowsky, 1898: 6).

1900: 6. IBBOTSON, F., and BREARLEY, H. The Estimation of Molybdenum in Steel and Steel-making Alloys.

Chem. News, **81**, 269; School Mines Quart., **22**, 97.
Influence of molybdenum on the determination of manganese by means of bromine and by the Williams–Ford method (1881: 18).

1900: 7. JERVIS, H. Note on the Estimation of Manganese in Steel.

Chem. News, **81**, 171; Chem. Centrbl., **1900**, a, 1038; J. Chem. Soc. (Lond.), **78**, 444; Stahl u. Eisen, **20**, 747; School Mines Quart., **22**, 94.
Determination in molybdenum powders and in tungsten steels by oxidation to permanganate by means of lead peroxide in nitric acid solution, and titration with oxalic acid or ferrous sulphate.

1900: 8. JOÜET, C. H. The Analysis of Slags and Cinders.

School Mines Quart., **22**, 71.
Determination by the Volhard method (1879: 14). Also precipitation by means of chlorate, separation from iron by means of acetates, and precipitation as phosphate.

1900: 9. McKenna, A. G. The Analysis of Chrome and Tungsten Steels.

Eng. Min. J., **70**, 124; Chem. Ztg., **24**, 243, Rep; Analyst, **25**, 301.

Precipitation by means of potassium chlorate, solution of the precipitate in hydrochloric acid and potassium nitrite, separation from iron by means of acetates, re-precipitation by means of bromine, and ignition to mangano-manganic oxide.

1900: 10. Mignot, A. Dosage volumétrique du manganèse dans les fers, fontes et aciers.

Ann. chim. anal. appl., **5**, 172; Chem. Centrbl., **1900**, b, 65; J. Soc. Chem. Ind., **19**, 854; J. Chem. Soc. (Lond.), **78**, 690; School Mines Quart., **22**, 94.

Determination by oxidation to permanganic acid by means of bismuth tetroxide and titration with hydrogen peroxide.

1900: 11. Pattinson, J., and H. S. Note on the Determination of Manganese as Sulphide.

Chem. News, **81**, 193; J. Chem. Soc. (Lond.), **78**, 443; Chem. Centrbl., **1900**, a, 1244.

Discussion of the incomplete precipitation as sulphide.

1900: 12. Truchot, P. Analyse des cuivres et des mattes industrielles.

Ann. chim. anal. appl., **5**, 442.

Separation from cobalt and nickel, and determination by precipitation as manganese ammonium phosphate. Determination in commercial copper.

SUBJECT INDEX.

QUANTITATIVE DETERMINATION OF MANGANESE.

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- **I. By precipitation as**
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    - 1830: 2 Fuss
    - 1836: 2 Thomson
    - 1851: 1 Laming
    - 1853: 8 Morfit and Booth
    - 1867: 2 Forbes
    - 1867: 4 Tosh
    - 1869: 8 Prior
    - 1870: 8 Rowan
    - 1871: 5 Rowan
    - 1872: 3 Fresenius
    - 1872: 10 Tamm
    - 1886: 16 Müller
    - 1888: 10 Meineke
    - 1893: 9 Jean
    - 1897: 8a Hillebrand
    - 1898: 1 Austin
    - 1898: 3 Brearley
    - 1900: 3 Hillebrand
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      - 1871: 3 Kammerer
      - 1874: 3 Piesse
      - 1874: 6 Willis
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      - 1879: 8 Mackintosh
      - 1879: 14 Volhard
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      - 1880: 9 de Koninck
      - 1881: 11 Kent
      - 1881: 17 Troilius
      - 1882: 2 Cabot
      - 1882: 4 Dewey
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      - 1883: 22 Wolff
      - 1884: 9 Holthof
      - 1885: 17 Reinhardt
      - 1885: 18 Reinhardt
      - 1886: 1 Atkinson
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      - 1886: 22 Reinhardt
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      - 1887: 18 ———
      - 1888: 12 Oettel
      - 1888: 14 v. Reis
      - 1888: 21 ———
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      - 1890: 5 Fresenius and Hintz
      - 1893: 11 Kosmann
      - 1893: 13 Parry and Morgan
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      - 1878: 6 Müller
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      - 1865: 4 Luckow
      - 1875: 1 Boussingault
      - 1877: 17 Riche
      - 1878: 8 Riche
      - 1880: 10 Luckow
      - 1881: 2 Classen
      - 1881: 3 Classen and v. Reis

(3) electrolysis—*Continued.*
1882: 10 Keiser
1883: 18 Schucht
1884: 4 Classen
1884: 17 Wieland
1885: 4 Classen
1886: 18 Moore
1889: 3 Brand
1889: 7 Kohn and Woodgate
1889: 18 Smith and Fränkel
1891: 13 Luckow
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1892: 21 Warwick
1893: 14 Rüdorff
1894: 2 Classen
1894: 16 Thomälen
1895: 5 Engels
1895: 6 Engels
1895: 16 Neumann
1896: 6 Engels
1897: 7 Engels
1898: 13 Kaeppel
1898: 21 Wolman
1900: 4 Hiorns

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1884: 7 Hanowsky
1886: 16 Müller
1887: 7 Donath and Zeller
1888: 11 Moore
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1890: 4 Carnot
1893: 2 Carnot
1894: 4 Jones
1899: 7 Friedheim and Brühl

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1866: 4 Reichardt
1875: 1 Boussingault
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1852: 2 Gibbs
1853: 9 Parkinson
1860: 7 Rose
1879: 14 Volhard

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1877: 10 Hannay
1879: 1 Beilstein and Jawein
1881: 1 Beilstein and Jawein
1881: 8 Ford
1882: 16 Troilius
1884: 9 Holthof
1887: 18 ————
1893: 9 Jean
1895: 7 Forestier
1896: 11 Mignot
1896: 17 Viard
1900: 8 Joüet
1900: 9 McKenna

(c) **manganese ammonium phosphate.**
1867: 3 Gibbs
1870: 11 Talbott
1871: 6 Tamm
1872: 1 Allen
1872: 3 Fresenius
1873: 2 Gibbs
1877: 1 Bolton
1877: 14 Munroe
1881: 8 Ford
1884: 3 Bloxam
1887: 2 Bayley
1887: 3 Blair
1888: 10 Meineke
1890: 3 Boyd
1890: 12 McKenna
1893: 9 Jean
1894: 13 Saniter
1896: 5 Dudley
1896: 11 Mignot
1898: 8 Gooch and Austin
1899: 5 Dunnington
1900: 1 Böttger
1900: 2 Dakin
1900: 8 Joüet
1900: 12 Truchot

(d) **manganous hydroxide.**
1856: 1 Gurlt
1875: 2 Kern
1876: 4 Kern

(e) **oxalate.**
1870: 2 Gibbs
1870: 3 Leison
1872: 3 Fresenius
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1877: 7 Classen

(f) **sulphide.**
1821: 2 Pfaff

(f) sulphide—*Continued.*
1857: 4 Terreil
1860: 2 Gorgeu
1860: 5 Rose
1860: 6 Rose
1861: 1 Fresenius
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1867: 4 Tosh
1869: 1 Classen
1869: 4 How
1870: 11 Talbott
1872: 3 Fresenius
1876: 2 Fresenius
1876: 4 Kern
1877: 5 Classen
1879: 1 Beilstein and Jawein
1879: 2 Carnot
1879: 7 Ledebur
1880: 2 Delffs
1883: 23 Zulkowsky
1885: 11 v. Jüptner
1888: 3 Friedmann
1888: 10 Meineke
1888: 16 Schürmann
1890: 5 Fresenius and Hintz
1893: 9 Jean
1894: 13 Saniter
1897: 8 Granger
1898: 15 Murmann
1898: 16 Murmann
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(g) vanadate.
1887: 6 Carnot

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(a) mangano-manganic oxide.
1836: 2 Thomson
1856: 1 Gurlt
1860: 2 Gorgeu
1865: 6 Warington
1866: 4 Reichardt
1867: 2 Forbes
1867: 4 Tosh
1870: 8 Rowan
1872: 3 Fresenius
1874: 3 Piesse
1874: 6 Willis
1875: 2 Kern
1876: 4 Kern
1877: 3 Classen
1877: 12 Kern
1878: 6 Müller
1879: 14 Volhard
1880: 4 Dunston
1881: 17 Troilius
1882: 2 Cabot
1882: 16 Troilius
1883: 22 Wolff
1884: 7 Hanowsky
1885: 11 v. Jüptner
1886: 16 Müller
1887: 7 Donath and Zeller
1887: 18 ————
1888: 12 Oettel
1888: 14 v. Reis
1888: 21 ————
1889: 3 Brand
1889: 7 Kohn and Woodgate
1891: 21 Pattinson
1893: 9 Jean
1893: 13 Parry and Morgan
1894: 2 Classen
1894: 13 Saniter
1895: 7 Forestier
1896: 14 Rurup
1897: 8a Hillebrand
1898: 1 Austin
1898: 7 Gooch and Austin
1900: 4 Hiorns
1900: 9 McKenna

(b) manganous oxide.
1843: 2 Ebelmen
1875: 2 Kern

(c) pyrophosphate. See "precipitation as manganese-ammonium phosphate."

(d) sulphate.
1879: 14 Volhard
1885: 15 Meineke
1888: 21 ————
1898: 1 Austin
1898: 7 Gooch and Austin

(e) sulphide.
1860: 5 Rose
1860: 6 Rose
1863: 3 Lippert
1876: 2 Fresenius
1879: 2 Carnot

III. By the method of

- **(a) Classen (oxalate).**
  - 1877: 3 Classen
  - 1877: 7 Classen
  - 1894: 9 Nass
- **(b) Ford.**
  - 1881: 5 Deshayes
  - 1881: 8 Ford
  - 1896: 5 Dudley
  - 1896: 14 Rürup
- **(c) Gibbs (pyrophosphate).**
  - 1867: 3 Gibbs
  - 1871: 6 Tamm
  - 1872: 1 Allen
  - 1877: 1 Bolton
  - 1890: 12 McKenna
- **(d) Rüdorff.**
  - 1892: 18 Rüdorff
  - 1895: 8 Gröger
- **(e) Wolff.**
  - 1883: 22 Wolff
  - 1885: 14 Mathesius
  - 1885: 17 Reinhardt
  - 1885: 18 Reinhardt
  - 1886: 27 Wolff
  - 1891: 5 Chemiker - Commission
  - 1893: 11 Kosman

IV. By miscellaneous methods.

- **(a) by difference.**
  - 1877: 18 Riley
  - 1879: 7 Ledebur
  - 1884: 2 Atkinson
  - 1884: 8 Holdich
  - 1885: 7 Diehl
  - 1888: 21 ———
- **(b) by dry assay.**
  - 1872: 11 Tamm
  - 1896: 3 Büttgenbach
- **(c) from oxygen absorbed by alkaline solutions.**
  - 1864: 4 Mittenzwey

(B) BY VOLUMETRIC METHODS.

I. By titration with potassium permanganate solution.

- **(a) Direct titration.**
  - 1863: 2 Guyard
  - 1864: 6 Winkler
  - 1865: 3 Habich
  - 1872: 3 Fresenius
  - 1878: 4 Morawski and Stingl
  - 1879: 14 Volhard
  - 1880: 5 Haswell
  - 1880: 7 v. Jüptner
  - 1881: 6 Donath
  - 1881: 7 Emmerton
  - 1881: 15 Särnström
  - 1883: 6 v. Jüptner
  - 1883: 11 Meineke
  - 1883: 14 Särnström
  - 1883: 15 Särnström
  - 1883: 17 Schöffel and Donath
  - 1883: 23 Zulskowsky
  - 1884: 1 Anger
  - 1884: 6 Gmelin
  - 1884: 15 Meineke
  - 1884: 18 Wolff
  - 1885: 18 Reinhardt
  - 1885: 20 Wolff
  - 1886: 23 Reinhardt
  - 1886: 27 Wolff
  - 1886: 28 Zimmermann
  - 1887: 4 Brand
  - 1887: 9 Jolles
  - 1888: 4 Ghilian
  - 1891: 2 Blum
  - 1891: 4 Brown
  - 1891: 5 Chemiker - Commission
  - 1891: 9 Hampe
  - 1891: 16 Moldenhauer
  - 1891: 25 Rubricius
  - 1891: 26 Rürup
  - 1892: 1 Aller
  - 1892: 4 Campredon
  - 1892: 7 Donath
  - 1892: 12 v. Reis
  - 1892: 16 Rubricius
  - 1892: 17 Rubricius
  - 1893: 1 Carnot
  - 1893: 6 Gorgeu
  - 1893: 9 Jean
  - 1894: 13 Saniter
  - 1894: 14 Seeliger
  - 1895: 2 Auchy
  - 1895: 18 Thomas

(a) Direct titration—*Continued.*
1896: 1 Auehy
1896: 12 Mixer and Dubois
1896: 13 Murkewitseh
1896: 14 Rürup
1896: 15 Stone
1897: 1 Auehy
1897: 3 Brearley
1897: 6 Devisse
1897: 10 Longi and Camilla
1898: 4 Campredon
1898: 14 Lehnkering
1899: 1 Brearley
1899: 4 Daw
1899: 8 Herting
1899: 10 Namias
1900: 8 Joüet
(b) Indirect titration.
1883: 10 Meineke
1883: 11 Meineke
1885: 15 Meineke
1886: 15 Meineke
1886: 17 Müller
1886: 24 Sehöffel and Donath
1887: 13 Lax
1891: 5 Chemiker - Commission
1891: 9 Hampe
1896: 7 Giorgis
1899: 13 Reiehard
II.[1] By precipitation as di-oxide, solution with the aid of a reducing agent, and titration for the excess of the latter.
Precipitation by means of
(a) bromine.
1872: 5 Kessler
1872: 6 Kessler
1879: 6 Kessler
1879: 7 Ledebur
1887: 14 Meineke
1887: 17 Reinhardt
1888: 13 Reinhardt
1893: 12 Low
(b) chlorine.
1861: 4 Möller
(c) hydrogen peroxide.
1886: 2 Barlow
1888: 2 Carnot
1889: 12 McCulloch
1890: 2 van Bemmeln
1893: 2 Carnot
1894: 4 Jones
1895: 4 Carnot
1895: 7 Forestier
1895: 19 Ulzer and Brüll
(d) hypochlorite.
1853: 4 Hempel
1854: 2 Streng
1855: 1 Mohr
1855: 2 Müller
1879: 9 Pattinson
1879: 10 Pattinson
1880: 13 Pattinson
1880: 16 Weldon
1880: 18 Wright and Menke
1884: 11 Ledebur
1886: 1 Atkinson
1887: 13 Lax
1893: 9 Jean
(e) potassium chlorate.
1877: 10 Hannay
1881: 18 Williams
1883: 4 Hampe
1883: 9 Maekintosh
1883: 13 Raimond
1883: 19 Stone
1883: 20 Stone
1883: 21 Troilius
1884: 11 Ledebur
1884: 12 Maekintosh
1885: 3 Cheever
1885: 10 Hampe
1885: 15 Meineke
1887: 13 Lax
1887: 15 Meineke
1888: 7 Julian
1888: 13 Reinhardt
1891: 4 Brown
1891: 5 Chemiker - Commission
1891: 9 Hampe
1891: 19 Norris
1891: 23 v. Reis
1891: 28 Ukena
1892: 2 Bastin
1892: 5 Chemiker - Commission

(e) **potassium chlorate**—*Continued.*
1892: 9 Hampe
1892: 13 v. Reis
1893: 9 Jean
1893: 10 Julian
1893: 13 Parry and Morgan
1894: 5 Jones
1895: 2 Auchy
1895: 7 Forestier
1895: 19 Ulzer and Brüll
1896: 5 Dudley
1896: 14 Rürup
1897: 9 Julian
1898: 6 Ford and Bregowsky
1898: 14 Lehnkering
1899: 16 J. T.
1900: 6 Ibbotson and Brearley

(f) **reduction of manganate by alcohol.**
1890: 13 Myhlertz

(g) **sodium chlorate.**
1898: 9 Gooch and Austin
1899: 8 Herting

Solution of the peroxide with the aid of

(a) **antimonious chloride.**
1872: 5 Kessler
1872: 6 Kessler
1879: 6 Kessler
1879: 7 Ledebur

(b) **arsenious oxide.**
1898: 9 Gooch and Austin

(c) **ferrous salts or oxalic acid.**
1853: 4 Hempel
1877: 10 Hannay
1879: 9 Pattinson
1879: 10 Pattinson
1880: 13 Pattinson
1880: 16 Weldon
1880: 18 Wright and Menke
1881: 18 Williams
1883: 4 Hampe
1883: 9 Mackintosh
1883: 13 Raimond
1883: 19 Stone
1883: 20 Stone
1883: 21 Troilius
1884: 11 Ledebur
1884: 12 Mackintosh
1885: 3 Cheever
1885: 10 Hampe
1885: 15 Meineke
1886: 1 Atkinson
1887: 13 Lax
1887: 14 Meineke
1887: 15 Meineke
1887: 17 Reinhardt
1888: 2 Carnot
1888: 7 Julian
1888: 13 Reinhardt
1889: 12 McCulloch
1890: 2 van Bemmeln
1890: 13 Myhlertz
1891: 4 Brown
1891: 5 Chemiker - Commission
1891: 9 Hampe
1891: 19 Norris
1891: 23 v. Reis
1891: 28 Ukena
1892: 2 Bastin
1892: 5 Chemiker - Commission
1892: 9 Hampe
1892: 13 v. Reis
1893: 2 Carnot
1893: 9 Jean
1893: 12 Low
1893: 13 Parry and Morgan
1894: 4 Jones, H. C.
1894: 5 Jones, J.
1895: 2 Auchy
1895: 4 Carnot
1895: 7 Forestier
1895: 18 Thomas
1895: 19 Ulzer and Brüll
1896: 5 Dudley
1896: 14 Rürup
1898: 6 Ford and Bregowsky
1898: 14 Lehnkering
1899: 16 J. T.

(d) **hydrochloric acid (Bunsen).**
1861: 4 Möller
1886: 2 Barlow

(e) **hydrogen peroxide.**
1893: 10 Julian

(e) hydrogen peroxide—*Continued.*
1897: 9 Julian
(f) potassium iodide.
1898: 9 Gooch and Austin
(g) stannous chloride.
1854: 2 Streng
1855: 1 Mohr
1855: 2 Muller
III. By titration of permanganic acid, after oxidation by means of
(a) bismuth tetroxide.
1888: 15 Schneider
1889: 17 Schneider
1898: 4 Campredon
1900: 10 Mignot
(b) lead peroxide.
1871: 2 Chatard
1872: 7 Leclerc
1877: 8 Deby
1878: 2 Deshayes
1878: 7 Prochaska
1881: 9 Forguignon
1885: 19 Schlagdenhauffen
1886: 21 Perillou
1886: 25 Setterwall
1887: 1 Babbitt
1887: 5 Cheever
1887: 19 ———
1888: 17 Stein
1888: 18 Thorpe and Hambly
1888: 19 Thorpe and Hambly
1892: 19 Schneider
1892: 20 Van Grundy
1900: 5 Ibbotson and Brearley
1900: 7 Jervis
(c) sodium bismuthate.
1895: 17 Reddrop and Ramage
Titration of the permanganic acid by means of
(a) ammonium oxalate.
1871: 2 Chatard
1888: 18 Thorpe and Hambly
1888: 19 Thorpe and Hambly
(b) arsenious oxide.
1877: 8 Deby
1878: 2 Deshayes
1886: 25 Setterwall
1887: 19 ———
1892: 20 Van Grundy
(c) ferrous salts.
1878: 7 Prochaska
1886: 21 Perillou
1888: 17 Stein
1900: 7 Jervis
(d) hydrogen peroxide.
1888: 15 Schneider
1889: 17 Schneider
1892: 19 Schneider
1895: 17 Reddrop and Ramage
1898: 4 Campredon
1900: 10 Mignot
(e) mercurous nitrate.
1872: 7 Leclerc
1881: 9 Forguignon
1885: 19 Schlagdenhauffen
IV. By the method of
(a) Chatard.
1871: 2 Chatard
1888: 18 Thorpe and Hambly
1888: 19 Thorpe and Hambly
1888: 20 Weissmann
(b) Carnot.
1888: 2 Carnot
1889: 12 McCulloch
1890: 2 van Bemmeln
1890: 4 Carnot
1897: 2 van Bemmeln
(c) Deshayes.
1878: 2 Deshayes
1887: 19 ———
(d) Donath.
1881: 6 Donath
1893: 6 Gorgeu
(e) Guyard.
1863: 2 Guyard
1865: 3 Habich
1882: 6 Dunn
1884: 15 Meineke
1893: 1 Carnot
1893: 6 Gorgeu
1893: 9 Jean
(f) Hampe.
1883: 4 Hampe
1884: 11 Ledebur
1885: 10 Hampe

(f) **Hampe**—*Continued.*
- 1886: 23 Reinhardt
- 1886: 24 Schöffel and Donath
- 1887: 13 Lax
- 1887: 15 Meineke
- 1888: 13 Reinhardt
- 1891: 5 Chemiker - Commission
- 1891: 23 v. Reis
- 1892: 5 Chemiker - Commission
- 1892: 9 Hampe
- 1892: 13 v. Reis
- 1894: 5 Jones, J.
- 1895: 19 Ulzer and Brüll
- 1896: 14 Rürup

(g) **Kessler.**
- 1872: 5 Kessler
- 1872: 6 Kessler
- 1879: 6 Kessler
- 1887: 13 Lax

(h) **Leclerc.**
- 1872: 7 Leclerc
- 1881: 9 Forguignon
- 1885: 19 Schlagdenhauffen

(i) **Lenssen.**
- 1860: 3 Lenssen.
- 1864: 2 Fresenius

(j) **Meineke.**
- 1883: 10 Meineke
- 1883: 11 Meineke
- 1885: 15 Meineke
- 1886: 15 Meineke
- 1886: 17 Müller
- 1886: 23 Reinhardt
- 1887: 13 Lax
- 1891: 5 Chemiker - Commission

(k) **Morawski and Stingl.**
- 1878: 4 Morawski and Stingl
- 1884: 15 Meineke

(l) **Pattinson.**
- 1879: 9 Pattinson
- 1880: 18 Wright and Menke
- 1884: 11 Ledebur
- 1886: 1 Atkinson
- 1886: 20 Pattinson
- 1887: 13 Lax
- 1891: 21 Pattinson
- 1893: 9 Jean
- 1894: 13 Saniter

(m) **Reinhardt.**
- 1888: 13 Reinhardt
- 1891: 5 Chemiker - Commission

(n) **Rössler.**
- 1879: 13 Rössler
- 1880: 15 Rössler
- 1894: 14 Seeliger

(o) **Rürup.**
- 1891: 2 Blum
- 1891: 25 Rubricius
- 1891: 26 Rürup

(p) **Särnström.**
- 1881: 15 Särnström
- 1883: 7 Kerl
- 1883: 15 Särnström
- 1890: 6 Hellman
- 1896: 12 Mixer and Dubois
- 1897: 1 Auchy

(q) **Schneider.**
- 1889: 17 Schneider
- 1895: 17 Reddrop and Ramage
- 1898: 4 Campredon

(r) **Schöffel and Donath.**
- 1883: 14 Särnström
- 1883: 17 Schöffel and Donath
- 1886: 24 Schöffel and Donath
- 1887: 13 Lax
- 1891: 5 Chemiker - Commission

(s) **Volhard.**
- 1879: 14 Volhard
- 1880: 5 Haswell
- 1880: 7 v. Jüptner
- 1881: 7 Emmerton
- 1882: 8 Haswell
- 1883: 6 v. Jüptner
- 1883: 11 Meineke
- 1884: 6 Gmelin
- 1884: 11 Ledebur
- 1884: 15 Meineke
- 1887: 9 Jolles
- 1888: 6 Iles
- 1891: 2 Blum
- 1891: 4 Brown
- 1891: 16 Moldenhauer

(s) **Volhard**—*Continued*
1891: 20 Namias
1891: 25 Rubricius
1891: 26 Rürup
1892: 1 Aller
1892: 12 v. Reis
1892: 16 Rubrieius
1892: 17 Rubrieius
1894: 13 Saniter
1895: 2 Auehy
1895: 18 Thomas
1896: 1 Auehy
1896: 13 Murkewitsch
1896: 14 Rürup
1896: 15 Stone
1897: 6 Devisse
1897: 10 Longi and Camilla
1898: 4 Campredon
1898: 14 Lehnkering
1899: 1 Brearley
1899: 4 Daw
1899: 8 Herting
1899: 10 Namias
1900: 8 Joüet
(t) **Weissmann.**
1888: 17 Stein
1888: 20 Weissmann
1895: 19 Ulzer and Brüll
(u) **Williams.**
1881: 18 Williams
1883: 9 Maekintosh
1883: 21 Troilius
1884: 12 Maekintosh
1885: 3 Cheever
1891: 4 Brown
1892: 2 Bastin
1893: 13 Parry and Morgan
1895: 2 Auehy
1896: 5 Dudley
1898: 6 Ford and Bregowsky
1899: 16 J. T.
1900: 6 Ibbotson and Brearley
V. By miscellaneous methods.
(a) **by means of alkali sulphides.**
1894: 10 Neumann
(b) **by reduction of potassium ferricyanide.**
1860: 3 Lenssen
1864: 2 Fresenius
(c) **by means of potassium ferrocyanide.**
1889: 13 Moldenhauer
1891: 3 Blum
1891: 14 Luekow
1891: 17 Moldenhauer
1897: 12 Miller
1897: 13 Miller and Mathews
1897: 16 Stone and van Ingen
(d) **by means of tartaric or malic acids.**
1868: 2 Juette
(e) **by means of silver nitrate (indirect).**
1879: 13 Rössler
1880: 15 Rössler
1894: 14 Seeliger
(f) **by the titration of manganate.**
1881: 10 Iles
1885: 12 Kalmann and Smolka
1899: 14 Reiehard
(g) **by the titration of manganic phosphate.**
1883: 4 Hampe.
1891: 18 Moore
(h) **by means of iodine (indirect).**
1890: 16 Vortmann
(i) **by solution of ignited oxide in reducing agents.**
1876: 3 Galbraith
1886: 2 Barlow

(C) BY COLORIMETRIC METHODS.

I. By oxidation to permanganic acid by means of
(a) **bismuth tetroxide.**
1895: 7 Forestier
1896: 11 Mignot
(b) **lead peroxide.**
1872: 8 Pichard
1876: 5 Peters
1881: 5 Deshayes
1883: 1 Goetz
1882: 11 Ledebur
1886: 8 Cheever
1886: 13 Hunt

(b) lead peroxide—*Continued.*
1887: 5 Cheever
1887: 16 Morgan
1893: 13 Parry and Morgan
1895: 7 Forestier
1896: 1 Auchy
1896: 11 Mignot
1897: 11 Lemaire
1897: 15 Schneider
1898: 18 Pichard

II. By the formation of metaphosphate.
1885: 16 Osmond
1891: 24 Rossi

III. By the formation of manganate.
1873: 1 Brünner
1874: 1 Koppmayer

IV. By the liberation of iodine.
1874: 2 Morrell
1875: 4 Morrell

(D) GENERAL DISCUSSION OF METHODS.

1875: 1a Bolton
1881: 11 Kent
1882: 6 Dunn
1882: 15 Tamm
1883: 16 Schmitt
1884: 13 Mackintosh
1884: 16 Stone
1885: 19 Schlagdenhauffen
1887: 13 Lax
1888: 10 Meineke
1889: 4 Finkener
1891: 21 Pattinson
1894: 13 Saniter
1895: 15 v. Jüptner
1895: 16 Neumann
1896: 1 Auchy
1896: 4 Dewey
1896: 10 v. Jüptner
1896: 14 Rürup
1897: 15 Schneider
1898: 13 Kaeppel (electrolytic)
1898: 21 Wolman (electrolytic)
1899: 3 Brearley

(E) SEPARATION FROM OTHER ELEMENTS.

(a) from alkaline earths.
1852: 2 Gibbs
1853: 9 Parkinson
1861: 4 Möller
1886: 2 Barlow

(b) from aluminum.
1860: 6 Rose
1865: 2 Gibbs
1865: 5 Rube
1879: 4 Classen
1879: 14 Volhard
1881: 3 Classen
1899: 9 Hess and Campbell

(c) from arsenic.
1837: 4 Shecrer
1895: 13 Jannasch and Kammerer

(d) from cadmium.
1889: 3 Brand
1891: 27 Smith
1892: 21 Warwick
1895: 14 Jannasch and Röttgen

(e) from calcium.
1827: 3 Stromeyer
1860: 6 Rose
1877: 4 Classen
1889: 2 Blum
1889: 16 Reitmar
1892: 14 Riggs

(f) from cerium.
1864: 3 Gibbs

(g) from chromium.
1865: 2 Gibbs
1884: 5 Classen
1894: 6 Kassner
1894: 11 Poleck
1895: 10 Jannasch and Cloedt
1898: 3 Brearley
1899: 7 Friedheim and Brühl

(h) from cobalt by means of
(1) chlorine.
1866: 5 Terreil
(2) citrates.
1892: 10 Moore

(3) cyanides.
  1841: 3 Liebig
  1853: 2 Flajolot
  1887: 10 Klobb
  1889: 11 McCulloch
(4) electrolysis.
  1888: 12 Oettel
  1889: 3 Brand
  1891: 15 Le Roy
  1898: 5 Engels
(5) hydrogen peroxide.
  1886: 2 Barlow
  1887: 7 Donath and Zeller
  1891: 10 Jannasch and Franzek
  1896: 9 Jannasch and Lehnert
(6) hypochlorite, hydrofluoric acid, and ammonia.
  1841: 4 Ullgren
(7) magnesium.
  1832: 2 Döbereiner
(8) Mercuric oxide.
  1835: 2 Persoz
(9) nitroso-β-napthol.
  1896: 2 Burgass
(10) oxalates.
  1827: 1 Du Menil
(11) phosphates.
  1858: 2 Henry
  1900: 12 Truchot
(12) potassium permanganate.
  1866: 5 Terreil
(13) potassium polysulphide.
  1845: 1 Cloez
(14) silver nitrate and ammonia.
  1839: 3 W.
(15) sodium peroxide.
  1893: 5 Clark
(16) solubility of chlorides in ether.
  1837: 1 Döbereiner
(17) the solubilities of the sulphides.
  1838: 2 Wackenroder
  1846: 1 Barreswil
  1847: 3 Rose
  1847: 4 Strecker
  1849: 1 Ebelmen
  1865: 2 Gibbs
  1866: 3 Frohde
  1869: 7 Muck
  1881: 4 Delvaux
  1886: 26 Sprenger
  1890: 5 Fresenius and Hintz
  1897: 8a Hillebrand
  1900: 3 Hillebrand
(18) volatility of chloride.
  1846: 4 Völker
(i) from copper.
  1869: 5 Luckow
  1884: 5 Classen
  1887: 11 v. Knorre
  1887: 12 v. Knorre
  1889: 3 Brand
  1893: 14 Rüdorff
  1895: 14 Jannasch and Röttgen
  1896: 2 Burgass
  1896: 8 Jannasch
  1897: 8a Hillebrand
  1899: 6 Fernberger and Smith
  1899: 7 Friedheim and Brühl
(j) from gallium.
  1882: 1 de Boisbaudran
(k) from iron by means of
  (1) acetates.
    1841: 2 Henry
    1862: 1 Abel
    1865: 2 Gibbs
    1866: 2 Eggertz
    1866: 4 Reichardt
    1867: 4 Tosh
    1869: 2 Damour
    1870: 8 Rowan
    1872: 5 Kessler
    1872: 6 Kessler
    1874: 3 Piesse
    1874: 6 Willis
    1875: 1 Boussingault
    1875: 4 Morrell
    1877: 13 Krämer
    1877: 18 Riley
    1877: 19 Rosenthal
    1877: 20 Stöckman
    1878: 3 Matzurka
    1878: 6 Müller
    1879: 8 Mackintosh

(1) acetates—*Continued.*
1880: 4 Dunston
1880: 6 Jewett
1881: 11 Kent
1881: 17 Troilius
1882: 2 Cabot
1882: 4 Dewey
1882: 9 Jewett
1884: 3 Bloxam
1886: 1 Atkinson
1886: 12 Deane
1886: 16 Müller
1886: 22 Reinhardt
1886: 26 Sprenger
1887: 18 ———
1888: 4 Ghilian
1888: 10 Meineke
1888: 14 v. Reis
1888: 21 ————
1889: 9 Mayer (qualitative)
1892: 4 Campredon
1892: 11 Priwoznik
1892: 14 Riggs
1893: 9 Jean
1893: 11 Kosman
1893: 13 Parry and Morgan
1895: 7 Forestier
1897: 3 Brearley
1897: 4 Brearley
1899: 2 Brearley
1900: 8 Joüet
1900: 9 McKenna

(2) ammonia in the presence of ammonium chloride.
1813: 1 Hatchett
1830: 2 Fuss
1876: 4 Kern

(3) arsenates.
1827: 1 Du Menil
1827: 2 Quesneville
1829: 3 Martini

(4) benzoic acid.
1806: 1 Berzelius
1812: 1 Pfaff
1829: 3 Martini
1836: 2 Thomson
1877: 9 Funaro

(5) camphoric acid.
1832: 5 Kastner

(6) chlorate.
See "precipitation by means of chlorate." See pp. 98 and 101

(7) chlorides.
1797: 1 Kirwan
1837: 4 Scheerer
1863: 3 Lippert

(8) chlorine.
1853: 12 Schiel
1861: 4 Möller

(9) electrolysis.
1830: 1 Becquerel
1881: 2 Classen
1881: 3 Classen and v. Reis
1882: 10 Keiser
1885: 5 Classen
1886: 10 Classen
1886: 11 Classen
1888: 12 Oettel
1889: 7 Kohn and Woodgate
1891: 15 Le Roy
1896: 6 Engels
1898: 5 Engel

(10) ether.
1892: 15 Rothe

(11) fusion with alkali and nitrate.
1833: 2 Planiawa
1894: 14 Seeliger

(12) ferrocyanide.
1886: 5 Blum

(13) hydrogen peroxide.
1888: 11 Moore

(14) iodine.
1879: 1 Beilstein and Jawein
1881: 1 Beilstein and Jawein

(15) a magnet after ignition in hydrogen.
1875: 2 Kern

(16) neutralization with carbonates.
1799: 1 Vauquelin
1812: 1 Pfaff
1821: 1 Herschell
1831: 1 Fuchs
1831: 2 Liebig
1832: 2 Döbereiner
1832: 6 Liebig
1834: 1 Demarçay

(16) neutralization with carbonates—*Continued.*
1853: 8 Morfit and Booth
1856: 1 Gurlt
1867: 2 Forbes
1885: 11 v. Jüptner
1888: 1 Campbell
1888: 4 Ghilian
1888: 10 Meineke
1890: 5 Fresenius and Hintz
(17) neutralization with metallic oxides.
1835: 2 Persoz
1857: 3 Field
1860: 1 Field
1865: 5 Rube
1872: 9 de Rezende
1879: 14 Volhard
1888: 10 Meineke
1894: 15 Smith and Heyl
See also (27).
(18) nitroso-β-naphthol.
1887: 11 v. Knorre
1887: 12 v. Knorre
1888: 10 Meineke
1890: 8 de Koninck
1896: 2 Burgass
(19) oxalates.
1806: 2 John
1811: 1 Bucholz
1827: 1 Du Menil
1829: 2 Lassaigne
1877: 6 Classen
1879: 4 Classen
1879: 5 Classen
(20) potassium "anthrazothionate"
1817: 1 Grotthuss
(21) suberic acid.
1832: 5 Kastner
(22) succinic acid.
1806: 1 Berzelius
1806: 2 John
1812: 1 Pfaff
1827: 2 Quesneville
1829: 3 Martini
1872: 10 Tamm
1877: 9 Funaro
1886: 4 Bein
1888: 4 Ghilian
1896: 11 Mignot
(23) sulphates.
1827: 2 Quesneville
1837: 4 Scheerer
1872: 5 Kessler
1872: 6 Kessler
1879: 6 Kessler
1888: 10 Meineke
1896: 14 Rürup
(24) solubilities of the sulphides.
1838: 2 Wackenroder
1886: 6 Carnot
(25) tartrates.
1792: 1 Hermbstadt
1796: 1 Richter
1812: 1 Pfaff
(26) volatilization of ferric chloride.
1814: 1 Davy
1819: 1 Brandes
1877: 12 Kern
1880: 3 Drown and Shimer
1888: 3 Friedmann
(27) zinc oxide.
1879: 14 Volhard
1880: 5 Haswell
1880: 7 v. Jüptner
1881: 7 Emmerton
1883: 10 Meineke
1884: 6 Gmelin
1884: 18 Wolff
1885: 14 Mathesius
1885: 20 Wolff
1887: 9 Jolles
1887: 14 Meineke
1887: 17 Reinhardt
1888: 10 Meineke
1895: 7 Forestier
1895: 19 Ulzer and Brull
(28) (method not indicated.)
1786: 1 Rinmann
1819: 2 Faraday
1819: 3 Pfaff
(l) from lead.
1896: 13a Neumann
(m) from magnesium.
1827: 3 Stromeyer
1860: 6 Rose

(m) **from magnesium**—*Continued.*
1868: 4 Terreil
1869: 2 Damour
(n) **from mercury.**
1886: 11 Classen and Ludwig
1889: 3 Brand
1894: 12 Rüdorff
1895: 9 Jannasch and Cloedt
1898: 12 Jannasch and Alffers
(o) **nickel, by means of**
(1) ammonium carbonate.
1872: 10 Tamm
(2) atmospheric oxygen.
1881: 4 Delvaux
(3) chlorine.
1853: 12 Schiel
1866: 5 Terreil
(4) electrolysis
1886: 14 Langbein
1886: 19 Moore
1889: 3 Brand
1891: 15 Le Roy
1896: 6 Engels
1898: 5 Engels
(5) hypochlorites, hydrofluoric acid, and ammonia.
1841: 4 Ullgren
(6) mercuric oxide.
1835: 2 Persoz
(7) peroxides.
1852: 2 Gibbs
1853: 9 Parkinson
1860: 7 Rose
1886: 2 Barlow
1887: 7 Donath and Zeller
1891: 10 Jannasch and Franzek
1893: 5 Clark
1896: 9 Jannasch and Lehnert
1899: 7 Friedheim and Brühl
(8) phosphates.
1858: 2 Henry
1900: 12 Truchot
(9) potassium permanganate.
1866: 5 Terreil
(10) through the solubilities of the sulphides.
1838: 2 Wackenroder
1847: 3 Rose
1849: 1 Ebelmen
1863: 3 Lippert
1865: 2 Gibbs
1866: 3 Frohde
1886: 6 Carnot
1886: 26 Sprenger
1888: 11 Moore
1890: 5 Fresenius and Hintz
1894: 3 Fleitmann
1897: 8a Hillebrand
1900: 3 Hillebrand
(11) (method not indicated.)
1882: 14 Mills and Becket
(p) **from phosphoric acid.**
1881: 2 Classen
(q) **from silica.**
1886: 12 Deane
1898: 6 Ford and Bregowsky
(r) **from silver.**
1895: 12 Jannasch and Kammerer
(s) **from thallium.**
1864: 1 Crookes
(t) **from tin.**
1853: 7 Löwenthal.
1861: 6 Rose
(u) **from tungstic acid.**
1896: 16 Taggart and Smith
(v) **from vanadium.**
1889: 15 Radau
(w) **from zinc by means of**
(1) carbonate.
1872: 10 Tamm
1879: 3 Classen
(2) acetic acid.
1788: 1 Porcel
1837: 3 Richter
1886: 4 Bein
(3) ammonium sulphocarbonate
1882: 7 Guyard
(4) ammonium sulphocyanate.
1880: 20 Zimmermann
(5) bromine
1869: 3 Galetti
1892: 3 Blum
(6) cyanides.
1853: 2 Flajalot
(7) electrolysis.
1830: 1 Becquerel.

(7) electrolysis—*Continued.*
1889: 3 Brand
1891: 21 Warwick
1899: 15 Riederer
(8) peroxides.
1852: 2 Gibbs
1853: 9 Parkinson
1860: 7 Rose
1886: 2 Barlow
1887: 7 Donath and Zeller
1890: 7 Jenseh
1891: 7 Donath
1891: 11 Jannasch and MacGregory
1891: 12 Jannasch and Niederhofheim
1893: 5 Clark
1895: 11 Jannaseh and Cloedt
1897: 8a Hillebrand
1899: 7 Friedheim and Brühl
1900: 3 Hillebrand
(9) phosphates.
1869: 9 Renard
1886: 14a Lösekann and Meyer
(10) solubilities of the sulphides.
1838: 2 Wackenroder
1842: 3 Otto
1849: 1 Ebelmen
1863: 3 Lippert
1865: 2 Gibbs
1868: 4 Terreil
1885: 9 Hampe
1887: 2 Bayley
1889: 14 Neumann
1890: 5 Fresenius and Hintz
1890: 14 Riban

(F) APPLICATIONS OF QUANTITATIVE METHODS.

Determination in
(1) **chromite.**
1890: 5 Fresenius and Hintz
(2) **chromium alloys.**
1877: 11 Kern
1892: 19 Schneider
1899: 16 J. T.
1900: 5 Ibbotson and Brearley
1900: 9 McKenna
(3) **commercial aluminum.**
1891: 22 Regelsberger
(4) **commercial copper.**
1882: 13 Lowe
1900: 12 Truehot
(5) **commercial nickel.**
1894: 3 Fleitmann
(6) **ferromanganese.**
1870: 8 Rowan
1877: 12 Kern
1878: 2 Deshayes.
1879: 6 Kessler
1885: 12 Kalmann and Smolka
1891: 21 Pattinson
1895: 15 v. Juptner
1896: 10 v. Juptner
(7) **flue deposits.**
1890: 7 Jenseh
(8) **food stuffs.**
1888: 17 Stein
(9) **German silver.**
1888: 12 Oettel
(10) **glass.**
1846: 3 Rowney
(11) **irons.**
1853: 8 Morfit and Booth
1862: 1 Abel
1863: 3 Lippert
1866: 2 Eggertz
1867: 4 Tosh
1872: 8 Pichard
1873: 1 Brunner
1874: 1 Koppmayer
1874: 3 Piesse
1874: 6 Willis
1875: 2 Kern
1876: 4 Kern
1876: 5 Peters
1877: 8 Deby
1878: 2 Deshayes
1879: 7 Ledebur
1881: 8 Ford
1881: 18 Williams
1882: 10 Keiser
1883: 1 Goetz
1883: 17 Schoeffel and Donath
1884: 3 Bloxam
1885: 3 Cheever
1886: 12 Deane

(11) **irons**—*Continued.*
1886: 26 Sprenger
1887: 1 Babbitt
1887: 16 Morgan
1887: 18 ————
1887: 19 ————
1888: 13 Reinhardt
1888: 20 Weismann
1888: 21 ————
1890: 6 Hellman
1891: 2 Blum
1891: 4 Brown
1891: 24 Rossi
1891: 25 Rubrieius
1892: 12 v. Reis
1892: 17 Rubricius
1893: 10 Julian
1895: 7 Forestier
1895: 19 Ulzer and Brüll
1896: 11 Mignot
1896: 13 Murkewitsch
1896: 14 Rürup
1898: 6 Ford and Bregowsky
1898: 16 Murmann
1899: 8 Herting
1900: 10 Mignot
(12) **iron ores.**
1866: 2 Eggertz
1872: 8 Pichard
1873: 1 Brünner
1874: 1 Koppmayer
1878: 9 Funaro
1877: 9 Ledebur
1879: 9 Pattinson
1879: 10 Pattinson
1883: 23 Zulkowsky
1885: 12 Kalmann and Smolka
1886: 1 Atkinson
1887: 3 Blair
1890: 13 Myhlertz
1891: 19 Norris
1891: 21 Pattinson
1897: 1 Auchy
1898: 6 Ford and Bregowsky
(13) **manganese bronze.**
1894: 5 Jones
(14) **manganese phosphides.**
1897: 8 Granger
(15) **manganic acid.**
1824: 1 Frommherz
(16) **meteorites.**
1879: 12 Pellitz
(17) **mineral or sea waters.**
1841: 2 Henry
1876: 2 Fresenius
1889: 5a Gooch and Whitfield
1899: 11 Natterer
(18) **plants.**
1897: 11 Lemaire
1898: 18 Piehard
(19) **Pyrolusite (and other manganese ores).** See "Quantitative Determination of Manganese Peroxide."
(20) **slags or silicates.**
1881: 10 Iles
1883: 8 Knop
1884: 10 Iles
1888: 6 Iles
1889: 5 Friedburg
1890: 13 Myhlertz
1891: 19 Norris
1891: 20 Namias
1900: 3 Hillebrand
(21) **soils.**
1890: 2 van Benmeln
1897: 2 van Benmeln
1898: 18 Pichard
(22) **spiegeleisen.**
1870: 4 Parker
1870: 8 Rowan
1874: 4 Parry
1874: 6 Willis
1875: 2 Kern
1875: 4 Morrell
1876: 3 Galbraith
1877: 8 Deby
1877: 12 Kern
1877: 18 Riley
1877: 20 Stöekmann
1878: 2 Deshayes
1879: 6 Kessler
1879: 9 Pattinson
1879: 10 Pattinson
1881: 8 Ford
1883: 19 Stone
1884: 2 Atkinson
1884: 3 Bloxam

(22) **spiegeleisen**—*Continued.*
1884: 8 Holdich
1884: 16 Stone
1885: 12 Kalmann and Smolka
1891: 21 Pattinson
1893: 9 Jean
1897: 3 Brearley
(23) **steels.**
1867: 2 Forbes
1872: 8 Pichard
1873: 1 Brünner
1874: 1 Koppmayer
1875: 1 Boussingault
1875: 2 Kern
1876: 5 Peters
1877: 8 Deby
1878: 2 Deshayes
1878: 6 Müller
1878: 7 Prochaska
1879: 9 Pattinson
1879: 10 Pattinson
1879: 14 Volhard
1880: 4 Dunston
1881: 7 Emmerton
1881: 9 Forguignon
1881: 11 Kent
1881: 17 Troilius
1881: 18 Williams
1882: 4 Dewey
1882: 10 Keiser
1883: 17 Schoeffel and Donath
1885: 3 Cheever
1886: 26 Sprenger
1887: 1 Babbitt
1887: 16 Morgan
1887: 18 ————
1887: 19 L'Assemblée Rep. Fab. Rails.
1888: 7 Julian
1888: 20 Weissmann
1888: 21 ————
1891: 2 Blum
1891: 24 Rossi
1891: 25 Rubricius
1895: 7 Forestier
1896: 7 Giorgis
1896: 11 Mignot
1896: 13 Murkewitsch
1896: 14 Rürup
1900: 6 Ibbotson and Brearley
1900: 7 Jervis
1900: 10 Mignot
(24) **tungsten alloys.**
1890: 18 Ziegler
1900: 5 Ibbotson and Brearley
1900: 7 Jervis
1900: 9 McKenna
(25) **Weldon mud.**
1874: 5 Pouchet
1875: 3 Lunge
1880: 8 Jurisch
1880: 11 Lunge
1880: 14 Post
1881: 12 Lunge
1889: 10 McKellar
(26) **wolframite.**
1890: 15 Sellik

(G) MISCELLANEOUS NOTES.

(a) **Determination of the state of oxidation of manganese.**
1841: 1 Berzelius
1842: 1 Lea
1861: 3 Mohr
1876: 6 Phipson
(b) **Study of the oxides of manganese.**
1878: 9 Wright and Luff
1880: 17 Wright and Menke
1880: 19 Veley
(c) **Effect of copper on precipitation of manganese.**
1870: 4 Parker
(d) **Effect of organic acids and grape sugar on precipitation of manganese.**
1858: 4 Spiller
1869: 4 How
1882: 12 Lefort and Thiebault
(e) **Use of mercuric chloride to aid filtration of sulphide.**
1898: 15 Murmann
(f) **Use of powdered glass in basic acetate separation from iron.**
1890: 17 Warren

(g) Filtration aided by addition of a concentrated solution of sodium acetate.
1888: 16 Schürmann
(h) Destruction of organic matter by means of barium peroxide before titration with permanganate.
1887: 4 Brand
1892: 12 v. Reis
(i) Determination of moisture in the analysis of pyrolusite.
1855: 3 Fresenius
(j) Use of hydrofluoric acid to hold silicic acid in solution.
1891: 19 Norris
1898: 6 Ford and Bregowsky
1900: 5 Ibbotson and Brearley.

QUANTITATIVE DETERMINATION OF MANGANESE PEROXIDE.

I. By evolution of chlorine, and absorption in solutions of
(a) alkaline hydroxides and determination of the hypochlorite formed.
1829: 1 Gay-Lussac
1835: 1 Gay-Lussac
1844: 1 Ettling
1869: 10 Sherer and Rumpf
1870: 10 Sherer and Rumpf
1870: 12 Tissandier
1877: 16 Perrey
(b) arsenious acid.
1853: 10 Price
1860: 4 Machnea
(c) ferrous sulphate.
1831: 3 Turner
1842: 4 Otto
1867: 1 Braun
1868: 3 Lunge
1869: 8 Prior
1885: 2 Charpentier
(d) potassium iodide, and titration of iodine.
1853: 1 Bunsen
1853: 5 Krieger
1861: 4 Möller
1869: 10 Sherer and Rumpf
1870: 1 Fresenius
1870: 5 Pattinson
1870: 10 Sherer and Rumpf
1877: 15 Parreño
1877: 16 Perrey
1879: 11 Pickering
1881: 13 Lunge
1888: 9 de Koninck and Lecrenier
(e) silver nitrate.
1843: 1 Baumann
(f) stannous chloride.
1851: 2 Müller
(g) sulphurous acid (precipitation of barium sulphate).
1832: 3 Duflos
1832: 4 Duflos
1837: 2 Ebelmen
1838: 1 Gieseler
1874: 5 Pouchet
II. By solution in presence of a reducing agent.
(a) antimonious chloride.
1872: 5 Kessler
(b) arsenious acid.
1898: 2 Bialobszeski
(c) ferrous salts.
1842: 2 Levol
1847: 2 Levol
1851: 4 Schabus
1856: 2 Schreiner
1869: 11 Teschenmacher and Smith
1870: 5 Pattinson
1877: 10 Hannay
1880: 11 Lunge
1881: 16 Terreil
1889: 4 Finkener
1889: 10 M'Kellar
(d) formic acid (with absorption of carbon dioxide).
1833: 1 Göbel
(e) oxalates (with absorption of carbon dioxide).
1843: 3 Fresenius and Will
1847: 6 De Vry
1861: 2 Kolbe

(e) oxalates—*Continued.*
1863: 1 Fresenius
1869: 6 Mohr
1869: 10 Sherer and Rumpf
1869: 11 Teschenmacher and Smith
1870: 5 Pattinson
1870: 10 Sherer and Rumpf
1871: 4 Luck
1877: 16 Perry
1881: 13 Lunge
1882: 3 Darton
1890: 1 Baumann
(f) oxalic acid (volumetric).
1870: 6 Paul
1889: 4 Finkener
(g) potassium iodide and acid.
1858: 1 Hempel
1882: 5 Diehl
1883: 5 Hempel
(h) stannous chloride.
1865: 1 Alfraise
1883: 3 Harvey
III. By gasometric methods. Measurement of
(a) carbon dioxide.
1832: 1 Berthier
1833: 3 Zenneck
(b) nitrogen.
1832: 1 Berthier
1833: 3 Zenneck
1897: 14 Purgotti
(c) oxygen evolved from hydrogen peroxide.
1885: 13 Lunge
1890: 1 Baumann
1890: 9 Lunge
1890: 10 Lunge
1890: 11 Lunge
1893: 3 Carnot
1893: 4 Carnot
1894: 7 Kippenberger
1894: 8 Lunge
1895: 3 Bodländer
(d) oxygen expelled on ignition.
1833: 3 Zenneck
IV. By loss of weight of metallic copper.
1839: 1 Fikentscher
1839: 2 Fuchs
1851: 3 Personne and Lhermite
1859: 1 Fikentscher
1859: 2 Nolté
1861: 5 Quadrat
1864: 5 ————
V. By fusion with chromic oxide and alkali.
1882: 17 Wagner
VI. By the method of
(a) Bunsen.
1853: 1 Bunsen
1853: 5 Krieger
1861: 4 Möller
1869: 10 Sherer and Rumpf
1870: 1 Fresenius
1870: 5 Pattinson
1870: 9 Sherer
1870: 10 Sherer and Rumpf
1874: 5 Pouchet
1877: 16 Perrey
1880: 13 Pattinson
1881: 13 Lunge
1889: 4 Finkener
(b) Fresenius and Will.
1843: 8 Fresenius and Will
1847: 6 De Vry
1862: 2 Röhr
1863: 1 Fresenius
1869: 6 Mohr
1869: 10 Sherer and Rumpf
1869: 11 Teschenmacher and Smith
1870: 5 Pattinson
1870: 9 Sherer
1870: 10 Sherer and Rumpf
1871: 4 Luck
1874: 5 Pouchet
1877: 16 Perry
1881: 13 Lunge
1890: 1 Baumann
(c) Gay-Lussac.
1829: 1 Gay-Lussac
1836: 3 Wittstein
1844: 1 Ettling
1860: 4 Machnea
1877: 16 Perry
1893: 9 Jean

- (d) **Lunge (gasometric).**
  - 1885: 13 Lunge
  - 1890: 1 Baumann
  - 1890: 9 Lunge
  - 1890: 10 Lunge
  - 1890: 11 Lunge
  - 1893: 3 Carnot
  - 1893: 4 Carnot
  - 1894: 8 Lunge
- (e) **Nolté.**
  - 1859: 2 Nolté
  - 1864: 5 ————

VII. Modification of apparatus for the method of

- (a) **Bunsen.**
  - 1888: 5 de la Harpe and Réverdin
  - 1894: 1 Christomanos
  - 1894: 17 Ullmann
- (b) **Gay-Lussac.**
  - 1847: 1 Bobierre
  - 1878: 5 Morawski and Stingl
- (c) **Lunge.**
  - 1890: 11 Lunge
  - 1894: 7 Kippenberger
- (d) **loss of weight on evolution of carbon dioxide from oxalic acid.**
  - 1898: 17 Northomb

QUALITATIVE DETECTION OF MANGANESE.

Detection by means of

- (a) **ammonium thiosulphate.**
  - 1883: 12 Orlowski
- (b) **fusion with alkalies.**
  - 1785: 1 Hjelm
  - 1836: 1 Kraskowitz
  - 1836: 2 Thomson
  - 1852: 1 Chapman
  - 1854: 1 Davy
  - 1877: 2 Chapman
  - 1889: 19 Wells and Vulté
- (c) **fusion with silica and the alkalies.**
  - 1878: 1 Bong
- (d) **blow-pipe bead tests.**
  - 1820: 1 Gahn
- (e) **blow-pipe reactions.**
  - 1866: 1 Bunsen
  - 1877: 2 Chapman
- (f) **bromate or bromine.**
  - 1897: 5 Cushman
  - 1898: 20 Vitali
- (g) **hydrogen peroxide.**
  - 1888: 8 Klein
  - 1889: 6 Klein
- (h) **formation of metaphosphate.**
  - 1815: 1 John
- (i) **microchemical tests.**
  - 1886: 3 Behrens
  - 1887: 8 Haushofer
  - 1891: 1 Behrens
  - 1892: 8 Frey
  - 1899: 12 Pozzi-Escot
- (j) **oxidation to permanganic acid.**
  - 1845: 2 Crum
  - 1852: 2 Gibbs
  - 1853: 3 Heizel
  - 1853: 6 Löwe
  - 1858: 3 Rose
  - 1870: 7 Polacci
  - 1883: 2 Guyard
  - 1884: 14 Maumené
  - 1886: 7 Christensen
  - 1895: 1 Alvarez and Jean
  - 1898: 19 Pichard
- (k) **ozone.**
  - 1847: 5 Schönbein
- (l) **phosphoric acid.**
  - 1846: 2 Phillips
  - 1857: 1 Barreswil
  - 1859: 3 Von Kobell
  - 1867: 1 Braun
  - 1876: 1 Campani
  - 1881: 14 v. Reis
  - 1885: 1 Bloxam
- (m) **fusion with potassium chlorate.**
  - 1857: 2 Böttger
  - 1872: 2 Böttger
  - 1880: 1 Böttger
- (n) **potassium ferricyanide.**
  - 1885: 6 Dean
  - 1885: 8 Draper
- (o) **potassium ferrocyanide.**
  - 1850: 1 Davy

(o) **potassium ferrocyanide**—*Continued.*
1854: 1 Davy
(p) **sodium hypobromite.**
1892: 6 Deniges
(q) **sodium peroxide.**
1893: 7 Hempel
(r) **spectrum analysis.**
1862: 3 Simmler
1872: 4 Horner
1875: 5 Vogel
1880: 12 Parry and Tucker
1898: 10 de Gramont
(s) **lead peroxide.**
1889: 8 de Koninck
(t) **separation from iron by means of nitrites.**
1897: 17 Wynkoop

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